Inhaltsverzeichnis

Destination 1 – Biodiversity and Ecosystem Services

HORIZON-CL6-2021-BIODIV-01-01: European participation in global biodiversity genomics endeavours aimed at identifying all biodiversity on Earth[1]

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 10.00 and 20.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding given the global dimension of this topic. International cooperation is encouraged. If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In support of the implementation of the Green Deal and the EU biodiversity strategy for 2030, successful proposals will help to create and maintain European nodes and networks integrated into global biodiversity genomics initiatives and help to better understand biodiversity decline, its main direct drivers and their interrelations.

Projects results are expected to contribute to at least four of the six following expected outcomes:

- Creation and management of the European node of the International Barcode of Life.
- Creation of a European hub affiliated to the Earth Biogenome Project, with a common goal and clear targets.
- Development of the necessary networks, technologies, quality standards, reference atlas and taxonomic expertise through Europe to systematically, and comprehensively identify specific, intra-specific and ecosystem diversity through genomics techniques, such as full-genome sequencing, barcoding and metabarcoding.

[1] *Such as the International Barcode of Life (iBOL) consortium, https://ibol.org/, and the Earth BioGenome Project global consortium, https://www.earthbiogenome.org/*

- Advances in the assessment of pan-European biodiversity via genome sequencing and/or DNA barcoding of threatened/endangered species, ecologically through barcoding and/or genome sequencing (animals, plants, fungi and microorganisms), ecological keystone species and economically important species, (e.g. pollinators and their biome, soil, forest, and marine and/or freshwater communities as well as invasive species and/or disease vectors).

- Pan-European barcoding of pollinators by completing the Barcode of Life for European bees, butterflies, moths and hoverflies.

- The active support and cooperation of citizen scientists and other non-professional taxonomists.

Scope: DNA-based identification systems can track biodiversity change on large geographic scales and reveal the interactions among the species in a biome. On the other hand, fully sequencing life, including, when relevant, information on symbiotic organisms, microbiomes and parasites, is expected to provide new tools for the conservation, preservation and regeneration of biodiversity, drug discovery and advanced biotechnology.

The International Barcode of Life (iBOL) consortium has set up high-throughput barcoding infrastructure to barcode all biodiversity on Earth by 2045 with the help of the international community and several new infrastructures across the world. Several EU and associated countries currently participate in the barcoding endeavour, but there is no pan-European node of iBOL as such.

Similarly, the Earth BioGenome Project (EBP), initiated in 2018, aims to sequence and catalogue the genomes of all of Earth's currently described eukaryotic species over a period of 10 years. Several European groups have joined the endeavour but no European target or project has been proposed yet.

Proposals should set up one or both European hubs for iBoL and/or EBP, and leverage resources and expertise to advance in completing the barcoding and/or sequencing of European biodiversity in a smart and efficient way, taking advantage of existing networks, infrastructures and expertise. Specific groups of ecological or economic importance, or species under threat, such as pollinators, mycorrhizal fungi, invasive species or disease vectors, should be sufficiently prioritised.

Projects should sufficiently plan their barcoding effort to maximise possible applications, such as, for example: registering patterns of biodiversity across ecoregions to forecast changes in response to anthropogenic drivers of biodiversity loss; discovering new species; tracking invasive alien species by metabarcoding forest soil samples, freshwaters or coastal waters; revealing symbiomes and trophic chains, etc. Proposals should contribute to the EU biodiversity strategy for 2030 by generating the reference genomes of the representative species across the tree of life, leveraging the existing genome sequencing facilities. Sample collection standards and protocols should be developed, validated and adopted, as should engagement actions and tools to allow citizens and other non-professional-taxonomist stakeholders to participate at different stages of the activities.

Data, results and methodologies from projects funded under this topic should contribute to the EC Knowledge Centre for Biodiversity[2], and be permanently and openly accessible in any relevant repositories. International cooperation with strategic third country partners is strongly encouraged, for example with Canada.

[2] https://knowledge4policy.ec.europa.eu/biodiversity_en

HORIZON-CL6-2021-BIODIV-01-02: Data and technologies for the inventory, fast identification and monitoring of endangered wildlife and other species groups

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In support of the implementation of the Green Deal, the EU biodiversity strategy 2030 and the Birds and Habitats Directives, successful proposals will help to bridge taxonomic and monitoring gaps, by providing methods, data, knowledge and models on the conservation status and ecological requirements of species and habitats and help to better understand and address biodiversity decline, its main direct drivers and their interrelations.

Projects results should contribute to some of the following expected outcomes:

- Systemic, integrated and (open-)standardised data, knowledge and models on the conservation status and ecological requirements of species and habitats, with a focus on those covered by the Birds and Habitats Directives and IUCN Red List. This will lead to better management of protected sites and species, in particular with a view to setting conservation objectives and developing appropriately designed and effective management plans

- The bridging of taxonomic and monitoring gaps thanks to new enabling tools, technologies, fast identification methodologies and integrated monitoring systems across Europe on wildlife species. These will help to identify biodiversity threats, such as invasive species, emergence of disease threats, conflict situations with production animals and/or human communities, etc.

- Models upscaling the results of biodiversity assessments to wider areas, based on existing datasets of environmental descriptors.

- Integrative taxonomy of inventory pollinator species (bees, butterflies, moths and hoverflies), soil fauna (mites, springtails, woodlices, millipedes and earthworms) and/or other threatened species groups

Scope: The EU biodiversity strategy contains concrete objectives to protect and restore biodiversity and to address the main pressures and threats to biodiversity. In order to achieve these objectives,

basic research is needed to better understand, monitor, observe and manage biodiversity, including in protected areas. Such knowledge is also indispensable to support the protection and restoration of natural capital and ecosystems.

Better, accessible and FAIR[3] data on species, biodiversity and ecosystems will also help to ensure that biodiversity preservation is a mainstream feature of other sectors, such as agriculture, transport, energy or the bioeconomy. There is a need for systemic and standardised biodiversity data on the ground in order to build up our knowledge on the status and trends of habitats and species and ecosystems, and on the drivers of decline.

Monitoring needs to be of better quality, greater relevance and more cost-effective. This is to be achieved by, among other things, developing, testing and implementing new (long-term) approaches that make use of recent technological advances and existing data from multiple origins (e.g. observation data, remote sensing, DNA technologies, big data analysis, AI, deep learning, historical records, use of citizen science and volunteer expert data).

Projects should develop, test and implement enabling tools, technologies and fast identification methodologies to produce and integrate data, knowledge and models on the conservation status of species and habitats, with a focus on those covered by the Birds and Habitats Directives. Projects should also help to develop an integrated European biodiversity monitoring system, in collaboration with the initiatives and projects mentioned below. There needs to be a particular focus on to those species and habitats, for which knowledge gaps still exist, and on those prioritised for conservation action in line with the EU biodiversity strategy 2030, such as pollinators, sea birds, marine mammals, invertebrates, amphibians, reptiles, bats, mosses, lichens, wetlands, coastal and marine areas, grasslands, mires, bogs and fens, heathland and shrubs.

The biogeographical approach of the Natura 2000 network needs to be taken into account. If the proposal addresses the pollinator-related outcomes, projects should produce an inventory of pollinator species through integrative taxonomy, and bridge taxonomic gaps by developing tools (field guides, identification keys, national reference collections and checklists, European online ID platform, image recognition/apps, digitalised collections, etc.) for bees, butterflies, moths and hoverflies.

Projects should contribute their data to the Knowledge Centre for Biodiversity[4] and earmark the necessary resources for cooperation with the Centre; projects should also promote synergies with the European co-funded partnership on biodiversity[5] (HORIZON-CL6-2021-BIODIV-02-01) and its activities. Cooperation is also expected with other relevant projects and initiatives, such as EUROPABON[6] which was awarded funding under the call 'SC5-33-2020: Monitoring ecosystems through research, innovation and technology', or with projects resulting from this specific call as well as other EU-funded calls. Strong collaboration and networking is expected with the future taxonomy CSA resulting from topic HORIZON-CL6-2022-BIODIV-01-02: 'Building taxonomic research capacity near biodiversity hotspots and for protected areas by networking natural history museums and other taxonomic facilities'.

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3 FAIR data principles: Findable, Accessible, Interoperable and Reusable https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf

4 The EC Knowledge Centre for Biodiversity (KCBD) is an action of the EU biodiversity strategy for 2030. It aims to enhance the knowledge base, facilitate its sharing and foster cross-sectorial policy dialogue for EU policy making in biodiversity and related fields. https://knowledge4policy.ec.europa.eu/biodiversity_en.

5 https://www.biodiversa.org/1759

6 https://europabon.org/

HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal will support the development of policies, business models and market conditions to scale up and speed up the implementation of nature-based solutions (NBS)[7]. It will contribute to the wider deployment of NBS and to fully reaping their economic, employment, social and environmental benefits in order to build a competitive sustainability in Europe and to tackle climate change. NBS contribute to the EU biodiversity strategy for 2030 and other Green Deal priorities, by supporting biodiversity and vital ecosystem services: climate change mitigation and enhancement of carbon sinks, biomass provision, access to fresh water, clean soil, healthy diets and lifestyles and sustainable food systems. NBS deployment will also create green jobs and build resilience to climate change and natural disasters.

Successful proposals will contribute to all following expected outcomes:

- Better understanding of the economic and financial performance of NBS, contributing to a greater promotion of investments in NBS and to an acceleration of market uptake.
- NBS markets are further developed and better structured.
- Actors involved in NBS markets are better equipped to conduct cost-benefit analysis and monetisation of NBS, and to address their funding needs, for greater implementation of NBS, including ecosystem-based disaster risk reduction approaches.

[7] As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In https://ec.europa.eu/research/environment/index.cfm?pg=nbs.

- NBS business cases are strengthened, contributing to greater adoption of NBS and awareness of their benefits.

- Regional and Europe-wide advisory services are equipped with better tools and create multi-stakeholder networks to more effectively support NBS project development and investment vehicles.

- Informing Mission Adaptation to Climate Change, the EU Adaptation Strategy and the EU Taxonomy on Sustainable Finance.

- Assess potential skill gaps and devise trainings to tackle this skill shortage

Scope: Developing markets for NBS has proved a continuing challenge. NBS investments are many and varied, with their benefits and costs differing by project type and context. They produce a range of benefits, many of which are public goods with limited revenue streams that may accrue to different stakeholder groups. Detailed understanding of these benefits is lacking. The same is true for potential economic benefits resulting from avoidance or reduction of costs due to NBS intervention (such as those related to insurance, penalty or capital costs). In addition, the variety of NBS and their context-specific nature across urban, periurban and rural realms, makes it difficult to predict reliably their commercial prospects. These features make financing of NBS projects challenging and investment from the private sector particularly so. As a result, funding of NBS has typically focused on a narrow range of public sources. Addressing knowledge gaps about the economic and financial performance of NBS investments, in combination with trialling the development of business cases and models for NBS implementation[8] is particularly urgent in the current context where NBS need to be exponentially scaled up to meet the policy priorities of the European Green Deal. Despite growing interest in NBS, upscaling NBS investment would require better understanding of different return on investment (ROI) models while accounting for indirect revenue streams associated with NBS (e.g. lower insurance costs for local government from investment in flood defences). The successful proposal should:

- Provide guidance for project developers and decision makers to take informed decisions about NBS: e.g. comparison of strengths and weaknesses of green and grey solutions in climate change adaptation; cost-benefit assessments for NBS (including both the initial capital investment and maintenance stage); resilience and insurance values of NBS; assessment of other co-benefits of NBS, including non-monetary ones. Synergies should be considered with the dedicated topic HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector;

- Analyse the potential for development of specific demand and supply chains in NBS;

- Provide methodological guidance on assembling NBS business cases, applying a Total Economic Value framework, of practical use to practitioners in making the case for NBS investments;

- Develop a coaching programme on NBS readiness assistance where businesses and projects selected for Investment Readiness Assistance receive coaching packages tailored specifically to

[8] The socio-political and cultural aspects of NBS are, in turn, the focus of HORIZON-CL6-2022-COMMUNITIES-01-05: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities.

their readiness levels and business objectives to advance the maturity of projects, taking also into account skill gaps;

- Create new or assess, streamline and provide access to existing toolboxes to support regional needs related to NBS financing and implementation; Consider the diversification of financing arrangements and mixes: co-financing and benefit sharing options with the private sector; PPPs; innovative financing mechanisms; and innovative arrangements, e.g. to involve and compensate the land owners who provide the space for NBS implementation;

- Assess the impacts and opportunities for NBS associated with the EU Taxonomy on Sustainable Finance and support the practical implementation of the Taxonomy by stakeholders;

- Analyse innovative financing approaches, including NBS 'green bonds' and blended finance at appropriate levels (e.g. European cities), while considering synergies with the European Investment Bank and any other relevant actors;

- Identify the potential for private investment in different NBS typologies and identify the critical conditions/actions necessary for upscaling, including research related needs. Provide a strategy for greater finance mobilisation through, for example, a NBS investment community or marketplace where potential project partners, entrepreneurs, investors, and innovation stakeholders can meet to discuss and advance investment in NBS;

- Identify and analyse case studies of multiple-benefit, co-governance/co-ownership projects with participation of the private sector, exploring their costs and benefits, analysing their financing strategies and identifying critical success factors;

- Explore synergies and interconnection of different EU initiatives (such as INTERREG, LEADER, URBACT, Covenant of Mayors, etc.) in terms of financing and potential for more coordinated actions and aggregated impact on NBS;

- Develop additional training and tailored courses, networking and B2B matchmaking sessions and other relevant events.

Proposals should address all of the above points.

This topic should involve the effective contribution of SSH disciplines.

Collaboration with the Biodiversity Partnership [9] (HORIZON-CL6-2021-BIODIV-02-01) is expected in the context of reinforcing the knowledge base for assessing, developing and deploying nature-based solutions.

Applicants should create synergies with projects under the same topic and other relevant ongoing or up-coming projects, notably the Horizon 2020 NBS project portfolio and its task forces; HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-COMMUNITIES-01-05: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities; HORIZON-CL6-2022-COMMUNITIES-02-02-two-stage: Developing nature-based therapy for health and well-being;

[9] https://www.biodiversa.org/1759

HORIZON-CL6-2021-COMMUNITIES-01-06: Inside and outside: educational innovation with nature-based solutions.

To this end, proposals should include dedicated tasks and appropriate resources for coordination measures, foresee joint activities and joint deliverables.

Proposals should ensure that all evidence, information and project outputs are accessible through the Oppla portal (the EU repository for NBS)[10].

HORIZON-CL6-2021-BIODIV-01-06: Nature-based solutions, prevention and reduction of risks and the insurance sector

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: This topic aims to support the development of policies, business models and market conditions to scale up and speed up the implementation of nature-based solutions (NBS)[11]. It will contribute to the wider deployment of NBS and to fully reaping their economic, social and environmental benefits in order to build a competitive sustainability in Europe and to tackle climate change. NBS contribute to the EU biodiversity strategy for 2030 and other Green Deal priorities, by supporting biodiversity and vital ecosystem services, notably building resilience to climate change and natural disasters.

Successful proposals will contribute to all following expected outcomes:

- More robust and integrated NBS for climate change adaptation and disaster risk reduction at local, regional, national and European level, notably contributing to the EU's Action Plan on the Sendai Framework for Disaster Risk Reduction, the EU Adaptation Strategy and Mission Adaptation to Climate Change.

- Wider recognition and implementation of NBS as their benefits (avoided damages) are fully recognised when compared to the costs of inaction, thus contributing to greater resilience and competitiveness of the European economy and society.

10 https://oppla.eu/.

11 As defined by the European Commission: Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Hence, nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services. In https://ec.europa.eu/research/environment/index.cfm?pg=nbs.

Greater engagement of the insurance sector in NBS markets and NBS funding and collaboration with other actors across different countries, regions, and cities.

Scope: The costs from climate-related hazards in Europe are increasing and are likely to rise even further and faster over the coming century due to a projected increase in the severity and frequency of events brought by climate change. This will exacerbate other changes related to land use and urbanisation. While encompassing the whole cycle of disaster risk management, in line with the implementation of the EU Sendai Framework over the next ten years (2015-2030) and the new EU Adaptation Strategy, special attention on the role of prevention and risk reduction in Europe is needed, notably through nature-based solutions (NBS). The role that the insurance and reinsurance industry can play in resilience and risk reduction is not sufficiently explored. Previous research highlights that the insurance sector can support action as institutional investors, insurance providers, innovators of new insurance products or as partners bringing their risk management expertise[12]. Data collected by insurance companies can help municipalities in their understanding of risk and to better prioritize climate adaptation measures[13]. However, several barriers remain insufficiently addressed to further engage the insurance sector in the particular case of NBS – from data management issues to overcoming the uncertainty of investments, or finding adequate regulatory incentives[14].

The successful proposal should:

- Establish a network and the needed collaborative and participatory arrangements and spaces between all relevant stakeholders in risk reduction across scales: insurers and re-insurers (including insurance associations), public authorities (local, regional and/or national), financing bodies (e.g. the EIB and other investors), farmers associations, relevant actors from the scientific community and potential links to other relevant initiatives (such as the Covenant of Mayors);

- Facilitate a dialogue at different levels of such a network of stakeholders on potential opportunities, strategies or mechanisms to foster collaborative action for a more robust decision-making and for increased risk prevention through NBS;

- Identify risk-related data requirements, mechanisms, existing tools, and opportunities for better data sharing (and data crowdsourcing) to identify areas at risk and potential areas of intervention through NBS or hybrid approaches;

- Support the establishment of secure and efficient data sharing mechanisms between local authorities, insurers and the private sector, taking into appropriate consideration data privacy issues;

- Develop agreed and robust metrics for the quantification of risk reduction performance, and/or ways to assess risk mitigation potential from NBS, including better integration of NBS models and catastrophe models, damage estimates under climate change scenarios and avoided damages;

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12 Weinberg, J., Thakar K., Marchal, R., Nanu, F. and Lopez Gunn, E. (2019). DELIVERABLE 8.3; Second Roundtable Report and Policy Brief. EU Horizon 2020 NAIAD Project, Grant Agreement N°730497.

13 Ebeltoft, M. (2016). Private-Public-Project: sharing insurance loss data to local and national authorities, (and scientists) in DRR and resilience work. NORDRESS Island, January 2016.

14 Marchal, R., Piton, G. Lopez-Gunn, E., Zorrilla-Miras, P. Van der Keur, P. Dartée, K. Pengal, P. et al. (2019). The (Re)Insurance Industry's Roles in the Integration of Nature-Based Solutions for Prevention in Disaster Risk Reduction—Insights from a European Survey. Sustainability 11 (22): 6212. https://doi.org/10.3390/su11226212.

- Identify financing options and existing success stories for NBS investments from insurance companies, including through blending mechanisms;
- Identify new insurance products that are transparent and affordable in terms of risk premiums and/or pooling of risks;
- Highlight best practices, and remaining gaps, related to the use of NBS to reduce and control risks, considering the type of hazard, location, and scale of intervention;
- Identify specific case studies related to NBS and reduction of risk in EU policies and strategies (e.g. the EU adaptation strategy, the action plan on the Sendai framework for disaster risk reduction, the common agricultural policy (CAP), the EU forest strategy, the Water Framework Directive, the Floods Directive, restoration objectives in the EU biodiversity strategy, etc.).

Proposals should address all of the above points.

Complementary activities such as interviews, research reviews and small research/experimentation-oriented actions may be envisaged. The stocktaking of previous Horizon 2020 projects on NBS, and how these results can be integrated in future insurance sector involvement should also be addressed.

Applicants should create synergies with projects under the same topic and other relevant ongoing or up-coming projects, notably the Horizon 2020 NBS project portfolio and its task forces; HORIZON-CL6-2021-BIODIV-01-05: The economics of nature-based solutions: cost-benefit analysis, market development and funding; HORIZON-CL6-2022-BIODIV-01-03: Network for nature: multi-stakeholder dialogue platform to promote nature-based solutions; HORIZON-CL6-2022-COMMUNITIES-01-05: Assessing the socio-politics of nature-based solutions for more inclusive and resilient communities. To this end, proposals should include dedicated tasks and appropriate resources for coordination measures, foresee joint activities and joint deliverables.

Proposals should ensure that project outputs are accessible through the Oppla portal (the EU repository for NBS)[15]. Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-BIODIV-01-07: Ecosystems and their services for an evidence-based policy and decision-making

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 13.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.00 million.
Type of Action	Research and Innovation Actions

15 https://oppla.eu/.

Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: In support to the EU biodiversity strategy for 2030 the successful proposal should provide knowledge to support EU and its Member States as well as relevant Associated Countries in the implementation of its actions and commitments by contributing to the integration of biodiversity and natural capital into public and business decision-making at all levels for the protection and restoration of ecosystems and their services. Successful proposals will contribute to all of the following expected outcomes:

- Inform the policy decisions affecting the environment thought a better understanding of the condition of ecosystems and their services in Europe, helping fill the current knowledge gaps.
- Contribute to the evidence and awareness of the importance of biodiversity, healthy ecosystems and the social and economic values that emerge from them though a better understanding of ecosystems services in relation with ecosystems condition.
- Support restoration targets and secure the sustainability of human activities and human well-being through the definition of the minimum criteria for ecosystems to achieve or maintain a healthy state or a good condition.

Scope: The first EU-wide Ecosystem Assessment report states that Europe's ecosystems, on which we depend for instance for food, timber, clean air, clean water, climate regulation and recreation, suffer from unrelenting pressures caused by intensive use of land or sea , climate change, pollution, overexploitation of natural resources and invasive alien species. Ensuring that ecosystems achieve or maintain a healthy state or a good condition is a key requirement to secure the sustainability of human activities and human well-being.

The successful proposal should cover the main knowledge gaps identified by the EU Ecosystem assessment[16] report to improve the assessment of the condition of ecosystems while providing uptake of the assessment's outcomes in policy. It should develop and test indicators not yet available for supporting the ecosystem and services assessment. This includes developing the minimum criteria, reference levels and aggregation schemes to define good ecosystem condition. This

[16] Maes, J., Teller, A., Erhard, M., Condé, S., Vallecillo, S., Barredo, J.I., Paracchini, M.L., Abdul Malak, D., Trombetti, M., Vigiak, O., Zulian, G., Addamo, A.M., Grizzetti, B., Somma, F., Hagyo, A., Vogt, P., Polce, C., Jones, A., Marin, A.I., Ivits, E., Mauri, A., Rega, C., Czúcz, B., Ceccherini, G., Pisoni, E., Ceglar, A., De Palma, P., Cerrani, I., Meroni, M., Caudullo, G., Lugato, E., Vogt, J.V., Spinoni, J., Cammalleri, C., Bastrup-Birk, A., San Miguel, J., San Román, S., Kristensen, P., Christiansen, T., Zal, N., de Roo, A., Cardoso, A.C., Pistocchi, A., Del Barrio Alvarellos, I., Tsiamis, K., Gervasini, E., Deriu, I., La Notte, A., Abad Viñas, R., Vizzarri, M., Camia, A., Robert, N., Kakoulaki, G., Garcia Bendito, E., Panagos, P., Ballabio, C., Scarpa, S., Montanarella, L., Orgiazzi, A., Fernandez Ugalde, O., Santos-Martín, F., *Mapping and Assessment of Ecosystems and their Services: An EU ecosystem assessment*, EUR 30161 EN, Pulications Office of the European Union, Ispra, 2020, ISBN 978-92-76-17833-0, doi: 10.2760/757183, JRC120383.

definition is not restricted to protected areas, but should encompass also forests, agroecosystems, urban areas, soil ecosystems, wetlands, fresh water and marine ecosystems. The proposal should addresses regional diversity and the corresponding decision level.

The proposal should investigate how good ecosystem condition is related to the capacity of ecosystems to deliver ecosystem services and focus on quantification of ecosystem services and on data derived from biodiversity and ecosystem monitoring in combination with models to study these. The proposal should develop and test methods and tools (in particular methods developed for natural capital accounting) to consistently report harmonised and verified ecosystem data at EU and Member State and Associated Country level that can be used to regularly report or assess the pressures and condition of ecosystems, dynamics, trends and changes over time.

The proposal should bring the individual MAES components 1) map ecosystems, 2) map and assess condition of ecosystems, 3) map and assess ecosystem services delivered by ecosystems together in integrated ecosystem assessments to better understand how the condition of various ecosystem types influences the delivery of different ecosystem services.

The proposal should demonstrate how to apply the MAES[17] outputs and other relevant ecosystem knowledge in practical policy, including its implementation, and other decision-making process (public and private) at various spatial and temporal scales while involving relevant stakeholders and citizens.

The proposal should follow up on European and global projects and networks to facilitate dialogue among the relevant scientific communities, funding bodies, relevant stakeholders and user communities in Europe throughout the duration of Horizon Europe.

The proposal should test and demonstrate the links between biodiversity, ecosystems and macro-economic policies and national policies for instance on agriculture, fisheries, forestry and climate. The proposal should develop and test practical applications seeking to harness the full potential of ecosystem services for evidence-based decision making. Ecosystem services need to be uptake and better integrated in different sectoral policies including, amongst others, urban and regional development, the common agricultural policy, conservation planning or marine spatial planning.

Applicants should create synergies with relevant projects under this Call. To this end, proposals should include dedicated tasks and appropriate resources for coordination measures, and, where possible, foresee joint activities and joint deliverables. Furthermore, cooperation is expected with the Biodiversity Partnership[18] (HORIZON-CL6-2021-BIODIV-02-01) and the Science Service HORIZON-CL6-2021-BIODIV-01-19. The proposal should set practical policy recommendations for the EU biodiversity strategy for 2030 targets, commitments, and ecosystem services-related policies, thereby contributing to the implementation, monitoring of progress and ratcheting up of the strategy's commitments as part of the European Green Deal.

The successful proposal should show how their results might provide timely information on relevant project outcomes. Cooperation is expected with projects under "HORIZON-CL6-2021-BIODIV-01-20: Support to processes triggered by IPBES and IPCC" and "HORIZON-CL6-2022-BIODIV-01-10: Cooperation with the Convention on Biological Diversity" for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), as well as the Convention on Biological Diversity.

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17 https://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm

18 https://www.biodiversa.org/1759

The successful proposal should ensure that all evidence, data and information will be accessible through the Oppla portal, and prepare the inclusion of its results, knowledge synthesis and policy briefs to the EC Knowledge Centre for Biodiversity. In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement. Where relevant, creating links to and using the information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.

HORIZON-CL6-2021-BIODIV-01-08: Supporting the development of a coherent and resilient Trans-European Nature Network

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: Contributing to the implementation of the EU biodiversity strategy for 2030, this topic aims to give support to building a coherent and resilient trans-European nature network (TEN-N) of protected areas, including through the set-up of ecological corridors, thereby contributing to the protection and restoration of ecosystems and their services in Europe.

Successful proposals are expected to contribute to all of the following outcomes:

- Development of a coherent and resilient trans-European nature network of protected areas, by supporting Member States on the key commitments for protecting at least 30% of EU land area, and strictly protecting at least 10% of EU land area.
- Setting up of ecological corridors – within and outside the network - to prevent genetic isolation, allowing for species migration including the response to climate change, and maintaining and enhancing healthy ecosystems, and delivering multiple ecosystem services.

Promote, support and demonstrate innovative and replicable financing solutions for the upscaling investments in green and blue infrastructure[19] (GI) and nature-based solutions (NBS).

[19] Green Infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It

Scope: The EU biodiversity strategy for 2030 addresses the on-going biodiversity decline through an EU Nature Protection and Restoration Plan across land and sea, including through the deployment of a truly coherent TEN-N increasing and interconnecting the current network of protected areas. The strategy includes key commitments for 2030 for legally protecting a minimum of 30% of the EU's land area and 30% of the EU's sea area and strictly protecting one third of the EU's protected areas, including all remaining EU primary and old-growth forests. Additionally, setting up and integrating ecological corridors will be important to prevent genetic isolation, allowing for species migration and dispersal, and for maintaining and enhancing healthy ecosystems. This is particularly relevant for increasing resilience of the network with respect to climate change[20].

The successful proposal should set up a strategic plan to support national authorities in identifying and selecting the relevant priority areas for EU land protection and the set-up of ecological corridors. It should be built on the existing EU network of protected areas and based on the EU Guidance to Member States[21], referred in the EU biodiversity strategy for 2030.

The successful proposal should consider various climate change scenarios, propose solutions for strengthening ecological connectivity under these different scenarios, through additional protected areas and ecological corridors. In this context, it should also consider the role of Green Urban Spaces and intensively managed ecosystems.

It should promote, support and demonstrate innovative and replicable financing solutions in GI and NBS and innovative cooperation and participatory approaches across borders among Member States on different levels involving a wide range of stakeholders across sectors.

The successful proposal should set out a clear plan to collaborate with national authorities and stakeholders, relevant projects under this call the EU Biodiversity Partnership, the Science Service under HORIZON-CL6-2021-BIODIV-01-19: 'A mechanism for science to inform implementation, monitoring, review and ratcheting up the new EU biodiversity strategy' as well with the EU Natura 2000 Biogeographical Process[22] which will be the main forum for discussion of the targets between the Commission, Member States and stakeholders. To this end, proposals should include dedicated tasks and dedicate appropriate resources for coordination measures, and, where possible, foresee joint activities and joint deliverables. The successful proposals should provide knowledge to Convention on Biological Diversity (e.g. SBSTTA/SBI) and to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services processes where relevant. Projects should ensure that all evidence, data and information will be accessible through the EC Knowledge Centre for Biodiversity.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement. Where relevant, creating links to and using the

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incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings." (European Commission, 2013)

20 Climate change impacts on ecosystems are now evident across all ecosystems, for example, where climate change is increasing the risk of forest fires and other ecosystem degradation. Furthermore, climate change is projected to drive species to higher latitudes. A more coherent network of nature is one of the solutions to mitigate impacts of and adapt to climate change and allow species to migrate.

21 This Guidance is currently under discussion in the frame of the EU Nature Directives Expert Group (NADEG) and should be finalized by the end of 2021 at the latest.

22 The Biogeographical Process is guided and monitored by the Expert Group on Natura 2000 Management, and Steering Committees composed of representatives of the Member States, the European Commission, the European Environment Agency, the European Topic Centre on Biological Diversity, the European Habitats Forum and the Natura 2000 Users Forum.

information and data of the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) is expected.

HORIZON-CL6-2021-BIODIV-01-09: Assessing and consolidating recent scientific advances on freshwater ecosystem restoration.

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 0.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 0.50 million.
Type of Action	Coordination and Support Actions

Expected Outcome: In support of the implementation of the Green Deal and the biodiversity strategy, a successful proposal will improve the knowledge to restore ecosystems and halt biodiversity loss, in particular Destination 'Biodiversity and ecosystem services' impact "Biodiversity in Europe is back on a path of recovery by 2030; ecosystems and their services are preserved and sustainably restored on land, in inland water and at sea through improved knowledge and innovation

The project will contribute to all of the following expected outcomes

- Support public authorities and other organisations engaged in ecosystem restoration to implement and prioritise innovative restoration approaches.
- Increase evidence of the potential of innovative restoration approaches to halt biodiversity loss and contribute to carbon storage in sediments and soils.
- Build the foundations for large scale restoration projects and related investments.

Scope: Freshwater ecosystems are degraded due to barriers and other morphological changes, loss of wetlands and floodplains, over abstraction of surface and ground waters, land management that reduces infiltration and generates pollution in land and seas. In responding to the climate and biodiversity crises and acknowledging that healthy water ecosystems are essential for climate adaptation there is an opportunity to determine how to prioritise and deliver aquatic and terrestrial ecosystem restoration at scale throughout Europe, both in rural and urban areas. There is a need to build on recent research from disparate research communities and approaches like the mapping and assessment of ecosystem services to identify how restoration can deliver on multiple objectives (ecosystem services, biodiversity protection, sediment management, climate adaptation, mitigation) and deliver value for citizens.

The objective of this topic is to determine how to implement the restoration of freshwater ecosystems and remove hydromorphological barriers to ensure sustainable environmental flows and to support achievement of good status in both surface and ground waters, long-term water resource management, biodiversity and climate resilience.

This topic should result in a comprehensive review of the knowledge about and past experience with effective approaches to freshwater ecosystem restoration. The scope should include methods for

detection and identification of ecosystem degradation, assessment and restoration potential, methods for prioritisation including ones based on mapping of ecosystem services, options for restoration including ones for heavily modified water bodies, approaches to long-term management of restored ecosystems and approaches for monitoring and evaluation including proper evaluation of environmental impacts of restoration options and contribution to climate mitigation. The governance aspects should play important role including strengthening relevant institutions, cross-sectoral collaboration between water and other relevant authorities, financing models for restoration measures, and long term maintenance and protection of restored bodies, economic analysis of costs and benefits, including citizens engagement.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-BIODIV-01-11: What else is out there? Exploring the connection between biodiversity, ecosystems services, pandemics and epidemic risk

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to European Green Deal priorities and the EU biodiversity strategy for 2030, whilst supporting the EU's response to the coronavirus and other zoonotic outbreaks, in the context of EU's goal of leading just digital, economic and ecological transitions that will leave no one behind, One Health approaches, and the future European Health Union. It will explore the evolution and spread of microbiomes in the wild and their relationship with biodiversity loss, ecosystems dynamics and epidemics risk, in a broad societal, climate change and global context. By doing so, the interrelations between biodiversity, health and environment (e.g. climate and land use) will be better known and communicated to citizens and policy-makers. In particular, risks associated with microbiomes and biodiversity-friendly prevention/mitigation/restoration measures, and opportunities for biodiversity recovery will be identified. This topic is also expected to have impacts related to 'Climate change mitigation and adaptation' and 'A resilient EU prepared for emerging threats'.

Projects results are expected to contribute to some of the following expected outcomes:

- The evolution and spread of microbiomes in the wild and their relationship with biodiversity loss and ecosystems dynamics is understood and modelled, within the broader context of socio-economic driving forces, climate change, public health, and increasing resilience.

- Epidemics risks are understood, mapped and forecasted on the basis of relationships between factors such as land use, ecology, climate, biodiversity, and socio-economic factors, including wildlife trade, that determine the pace at which new pathogens emerge and then spread once transmission between humans occurs.

- Contribution to ecosystem services: use of novel technologies for better land use and environmental management, increasing (or at least preserving) biodiversity under unfavourable environmental/climatic conditions.

- Sustainable prevention/mitigation measures improving microbiomes and biodiversity conservation/recovery are proposed.

- Molecular and phylogenetic characterisation of potential emerging and novel pathogens and their hosts in both natural and human-modified areas for use as pre-leads in future vaccines, antimicrobials and other prevention strategies.

- Pathogen detection and surveillance strategies, focusing on human populations at risk but also on potential reservoirs and vectors, based on rapid, on-site, genomic tools allowing a fast and early response when facing potential outbreaks.

- New multidisciplinary collaborations that embody the One Health/EcoHealth concept are active and efficient as a way to prevent pandemics, sustain biodiversity, promote human, animal and ecosystem health and nature conservation, as well as support the needed transformative change.

- Effective strategies to increase awareness and participation of indigenous and local communities in pandemics prevention are in place: risks management and opportunities for biodiversity conservation/recovery are built together.

Scope: Wildlife microbiomes, whether symbiotic, commensal or pathogenic, and their potential to spread by crossing interspecies barriers, eventually reaching humans via transitional interfaces (e.g. peri-urban, farming areas), are still largely unknown. Complex links between increased human-mediated disturbance, land-use change, natural habitat loss/degradation/fragmentation, climate change and biodiversity loss have all been linked to increases in the increased prevalence and risk of zoonotic disease for a variety of pathogens, mostly driven by human activities that modify the environment or spread pathogens into new ecological niches[23]. Zoonotic diseases are significant threats to human health, with vector-borne diseases accounting for approximately 17 per cent of all infectious diseases and causing an estimated 700,000 deaths globally[24] in a normal year, which can more than double in pandemic years[25].

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23 Whitmee et al. 2015 and CBD SoK 2015

24 IPBES Global Assessment on Biodiversity and Ecosystem Services & IPBES The assessment report on land degradation and restoration.

25 In the first twelve months of the COVID-19 pandemic, more than 2 million related deaths have been officially registered worldwide (worldometers.info/coronavirus, 19 January 2021).

The magnitude and direction of altered disease incidence due to anthropogenic disturbance differ globally and between ecosystems. Some described mechanisms and drivers that especially affect infectious disease risk are[26] habitat alteration (e.g. deforestation, urbanisation), depletion of predators, biological invasion, host transfer, biodiversity change, human-driven genetic changes, bushmeat hunting and consumption, environmental contamination by infectious agents, international exchanges, trade, etc.

This call aims to recover biodiversity and ecosystems services whilst predicting and preventing future pandemics and epidemic outbreaks, especially in tropical areas and biodiversity hotspots, through collaboration between environmental (including climate), ecological, biomedical and social sciences. Projects should map, identify and characterise (e.g. with molecular techniques) potential emerging pathogens and their hosts/vectors in both carefully selected natural and human-modified areas, explore the relationship of biodiversity and ecosystems dynamics with microbiomes' evolution and spread, within the broader context of socio-economic driving forces, climate change, public health and animal health.

Pathogen discovery, prophylaxis and operational surveillance strategies should be developed to search for new potential pathogens, within natural and human-modified ecosystems and hosts as well as in cases of human infectious diseases of unknown aetiology, to prevent, detect and contain their outbreaks. Risk maps and predictive models should be built based on development trends, the presence of probable host/bridge species, environmental and socio-economic factors.

The impacts of land use and climate change on biodiversity, ecosystem services and pandemics should be also taken into account, as well as any recent IPBES reports on the links between biodiversity and pandemics[27].

Ecologists, infectious-disease researchers, medical doctors, veterinarians, environmental, public-health and animal-health experts, socio-economic stakeholders and the private sector, particularly SMEs, as well as authorities, civil and political entities, should contribute among others to devise an early warning mechanism, track environmental change, assess the risk of pathogens crossing over and reduce risky human activities.

Efforts to preserve/restore biodiversity should address the economic and socio-cultural factors that drive natural habitat alteration and the rural poor's dependency on hunting and trading wild animals. International cooperation with non-EU countries where new pathogens have emerged is strongly encouraged. Projects should ensure availability and interoperability of their data with the EC Knowledge Centre for Biodiversity and earmark the necessary resources for cooperation. Collaboration with the Biodiversity Partnership (HORIZON-CL6-2021-BIODIV-02-01) and creating links to its activities is expected[28].

This topic should involve the effective contribution of social sciences and humanities (SSH) disciplines.

HORIZON-CL6-2021-BIODIV-01-13: Breeding for resilience: focus on root-based traits

Specific conditions

[26] Patz & Confalonieri (2005) Human Health: Ecosystem Regulation of Infectious Diseases. Ecosystems and Human Well-being: Current State and Trends. 1. cited in IPBES global assessment report, 2019

[27] IPBES (2020) Workshop Report on Biodiversity and Pandemics. Daszak, P. et al. doi:10.5281/zenodo.4147317 https://ipbes.net/pandemics

[28] https://www.biodiversa.org/1759

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 16.00 million.
Type of Action	Research and Innovation Actions

Expected Outcome: In line with the objectives of the biodiversity and farm to fork strategies, a successful proposal will support the transition to more sustainable practices in agriculture by reducing the need for external inputs and supporting biodiversity in agroecosystems.

The project results are expected to contribute to all of the following expected outcomes:

- A better understanding of root-based traits (including the capacity to establish beneficial interactions with soil biota) and their genotypic variability as well as increased insight into the (adaptive) phenotypic plasticity of roots;
- Enhanced capacities for root phenotyping under controlled and on-field conditions;
- The delivery of strategies for breeding for below-ground traits capitalising on more effective interactions between plants and microorganisms in the rhizosphere;
- An increased use and valorisation of genetic resources (in situ and ex situ) for root based traits.

On the longer term projects will contribute to: the development of crops (annual and perennial) and forest trees that are more tolerant to abiotic stress conditions, require less external inputs (e.g. fertilisers and pesticides) and show an increased capacity for carbon sequestration, thereby contributing to adaptation of agriculture and forestry to climate change.

Scope: With increasing effects of climate change and a shift towards low(er) input production systems, there is the need for crops that are capable of capturing resources more efficiently and are resilient to abiotic stresses.

The root system and its interaction with soil biota is crucial for nutrient and water acquisition as well as for the capacity of plants to adapt to changing environments and to be more tolerant against pests and diseases. Phenotypic plasticity is key for plants to respond to varying soil conditions and highly dynamic distribution of soil resources. The size and architecture of the root system also determine the allocation of carbon in the soil. Breeding for root traits is therefore a promising strategy to increase plant stress resilience while also enhancing soil carbon sequestration.

Proposals should:

- Identify root traits that increase resource efficiency of plants in different environments, taking into account beneficial plant – microbe interactions and the restitution of plant-fixed carbon to the soil;
- Increase our knowledge on the (molecular and biochemical) plasticity of root responses and their metabolic mechanisms to environmental cues;

- Improve existing and/or develop new root phenotyping tools (including image analysis protocols) to be used in controlled and on-field conditions, thereby overcoming the root data bottleneck;
- Develop strategies to implement "root breeding", i.e. select for desirable root characteristics and exploit the genetic variation in root traits.

Activities should be carried out in a range of agronomically relevant soil conditions.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-BIODIV-01-14: Fostering organic crop breeding

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal should support the objectives of the EU biodiversity and farm to fork strategies to transition to fair, healthy and environmentally-friendly food systems from primary production to consumption, notably the objective to increase organic farming. They should do so by increasing the availability of and access to suitable plant reproductive material for organic crops and by increasing the competitiveness of the organic crop breeding sector. As such, activities funded under this topic will help the EU achieve the target of at least 25% of the EU's agricultural land under organic farming by 2030. Project results are expected to contribute to all the following expected outcomes:

- Greater knowledge of relevant traits for organic crop production;
- Improved and open access to a wider pool of high-quality plant reproductive material for the organic crop sector;
- Improved adaptation of new organic crop varieties and organic heterogeneous material to organic farming conditions (e.g. agronomic performance under organic cultivation practices,

disease resistance, resilience to drought, longevity, adaptation to different pedo-climatic conditions, nutritional quality, etc.);

- Improved identification and traceability of organic heterogeneous material (OHM);
- Increased competitiveness of the organic crop breeding sector achieved by (i) improved availability of breeding strategies for organic crop production; (ii) novel governance and financing models supporting new breeding initiatives for organic crop production; (iii) increased relevance of the organic sector for commercial plant breeders and seed producers generating increased demand for organic seed and breeding; (iv) improved quality and transparency in the organic plant reproductive material market; (v) training, demonstration and networking.

Scope: Promoting the use of more sustainable farming practices is an EU policy objective enshrined in the European Green Deal and its related strategies. Boosting organic farming in the EU, one of these objectives, can greatly contribute to achieving the ambition to significantly reduce the use and risk of inputs in farming while making agriculture more resilient, including through increased (bio)diversity. Increasing the availability of organic varieties for the organic sector that are better adapted to different and variable conditions is important in order to improve the performance of the organic crop sector. Application of the new organic Regulation[29] (EU) No 2018/848 has the potential to support higher levels of biodiversity and greater resilience in the organic sector with the use of new tools such as the definition of organic heterogeneous material (OHM) and organic varieties. The possibility to use landraces can also revive traditional and regional crops. However, achieving adequate and timely upscaling of organic breeding and seed production that meet growing market demands can be challenging for the sector. Strong involvement from public and private actors, novel governance and financing models for breeding, variety testing and seed production, as well as training, are needed.

Proposals should contribute to improving the availability and quality of plant reproductive material and the selection of varieties suited to the specific conditions of organic farming, in line with the objectives and requirements for organic plant reproductive material set out in Regulation (EU) No 2018/848 and the transformation of the EU's breeding sector. Proposals must implement the 'multi-actor approach' and ensure a value chain approach with adequate involvement of the farming sector. Activities should take into account the diversity of seed systems in the EU. The topic is open to all types of organic farming systems in various geographical and pedo-climatic conditions. In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Proposals should develop measures to support the preservation of genetic resources and increase the availability of plant reproductive material for the organic sector, including through pre-breeding and breeding activities and new approaches to seed sourcing.

Proposals should develop measures that contribute to the development of organic heterogeneous material[30] and varieties suitable for organic cultivation for an increasing range of crops, including arable, forage and horticultural crops.

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29 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.150.01.0001.01.ENG

30 'Organic heterogeneous material' means a plant grouping within a single botanical taxon of the lowest known rank which: (a) presents common phenotypic characteristics; (b) is characterised by a high level of genetic and phenotypic diversity between individual reproductive units, so that that plant grouping is represented by the material as a whole, and not by a small number of units; (c) is not a variety within the

Proposals should develop specific protocols for testing new organic varieties. Measures should consider the adaptability of OHM and organic varieties to different climatic and edaphic conditions, and resistance to pests and diseases, as well as combining these assets with crop stability, productivity and nutritional content in order to maintain a level of competitiveness of the organic plant reproductive material. The potential of OHM to foster and improve the use of traditional material in organic crop farming should be analysed.

Proposals should develop a toolbox to identify OHM and a system to ensure OHM breeding traceability and maintenance. Case studies of innovative engagement of value chain partners in organic plant breeding in different contexts should be analysed and key factors of success should be identified. Proposals should develop governance and financial models to support organic plant breeding that include all actors in the value chain. Proposals should conceive marketing and value chain development strategies to introduce improved varieties for seed multiplication and treatment, ensuring quality and transparency in the organic seed market. Proposals should set up new networks, and expand existing ones where relevant, to demonstrate and test organic crop breeding in different pedo-climatic regions across Europe, with an emphasis on regions where the organic sector is less developed. Proposals will give attention to participatory on-farm demonstrations. Proposals should design training packages tailored to the specific needs of different actors of the organic breeding and seed business to strengthen their capacities and increase breeding gains.

Proposals should develop scientifically robust and transparent methodologies, building on achievements from previous research activities. To ensure trustworthiness, swift and wide adoption by user communities, and to support EU and national policy-makers, actions should adopt high standards of transparency and openness, going beyond ex-post documentation of results and extending to aspects such as assumptions, models and data quality during the life of projects.

HORIZON-CL6-2021-BIODIV-01-17: Policy mixes, governance (including financing) and decision-making tools for transformative action on biodiversity

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions

Expected Outcome: In line with the EU biodiversity strategy, successful proposals will develop knowledge and tools to understand the role of transformative change for biodiversity policy making, address the indirect drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative changes in our society.

Projects should address all following outcomes:

meaning of Article 5(2) of Council Regulation (EC) No 2100/94 (1); (d) is not a mixture of varieties; and (e) has been produced in accordance with this Regulation.

- Tools promoting the benefits of biodiversity are taken up by policy makers, industries, civil society organisations including NGOs, financing entities, businesses and retailers. These solutions can include a stocktaking of good practice (in addition to natural capital accounting and reporting), standards, agreements, charters, commitments, regulations, financing streams (positive incentives vs harmful subsidies), engaging society and incorporating lifelong learning.

- Increased use and mainstreaming of 'green over grey' approaches, in particular by adopting nature-based solutions on land and at sea, in line with the Green Deal's 'do no significant harm' principle.

- Ways to facilitate the application of systemic, sustainable policy mixes and governance approaches, based on a range of policy tools, economic instruments or regulations.

- Developing and testing approaches on (1) mitigating existing and future risks to biodiversity and on (2) better reflecting how biodiversity loss affects company business models, value chains, profitability and long-term prospects, so that methods and tools can be integrated into decisions, while factoring in societal and democratic processes (citizen engagement, political campaigns, science denialism).

- Making options available on how to implement in practice the renewed sustainable finance strategy for the financial system to generate a positive impact on biodiversity.

- Promoting tax systems and pricing that reflect environmental costs, including biodiversity loss, to shift the tax burden from labour to pollution, and to tackle the issue of under-priced resources and other environmental externalities.

- Making available case studies on what transformational change[31] means in practice.

- Improving the understanding of the biodiversity inter-dependencies of the SDGs. Supporting IPBES and IPCC work by providing input from European research and innovation. Providing approaches, tools and knowledge influence policies at the right level on transformative change for biodiversity. The key elements for this change will be delivered by the broader portfolio of collaborative projects (of which these projects developing the toolbox for transformative changes with a positive effect on biodiversity, providing policy mixes, science-policy communication, governance and decision-making tools form part).

Scope: Policy mixes, governance (including financing) and decision-making tools to achieve the necessary ecological, climate, economic and social transition for biodiversity are not yet widely available, and must be developed. Proposals should take up the work of the renewed sustainable finance strategy which will help ensure that the financial system contributes to mitigating existing and future risks to biodiversity.

Proposals should look at how to further mainstream biodiversity into policy making, science, and governance (including financing) to achieve transformative action within and beyond socio-economic, climate and environmental agendas.

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[31] Referring to, and critically assessing, the understanding of transformative change in IPBES and GBO-5, EEA and based on existing tools such as https://www.sustainable-prosperity.eu/ or workshops https://ec.europa.eu/info/events/workshop-transformative-change-global-post-2020-biodiversity-framework-2020-mar-18_en

Proposals should build their analysis on the synergies of multiple Sustainable Development Goals, to deliver direct and indirect biodiversity benefits, and on the role of biodiversity in reaching the set of Sustainable Development Goals.

Proposals should produce case studies and a collection of good and failed examples of developing and implementing policy tools, best practices and instruments, which could feed into the just transformation process and inform and inspire transformative change through learning, co-creation and dialogue.

Proposals should include specific tasks and allocate sufficient resources to develop joint deliverables (e.g. activities, workshops, joint communication and dissemination) with all projects on transformative change related to biodiversity funded under this destination. They should use existing platforms and information sharing mechanisms relevant for transformational change and on biodiversity knowledge[32]. Projects are expected to cooperate with the European partnership on biodiversity (HORIZON-CL6-2021-BIODIV-02-01) and the Science Service (HORIZON-CL6-2021-BIODIV-01-19). Proposals should show how their results and outcomes could provide timely information for major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), the Intergovernmental Panel on Climate Change (IPCC), and the Convention on Biological Diversity[33].

This topic should involve contributions from the social sciences and humanities disciplines.

HORIZON-CL6-2021-BIODIV-01-18: Understanding the impacts of and the opportunities offered by digital transformation, new emerging technologies and social innovation on biodiversity

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Due to the scope of this topic, legal entities established in all member states of the African Union are exceptionally eligible for Union funding.

Expected Outcome: In line with the EU biodiversity strategy, successful proposals will develop knowledge and tools to understand the role of transformative change for biodiversity, tackle indirect

[32] BISE, EC Knowledge Centre for Biodiversity, BiodivERsA, Oppla, NetworkNature and their joint work streams

[33] In particular the policy support function of IPBES, https://ipbes.net/policy-support. Projects are requested to cooperate with projects 'HORIZON-CL6-2021-BIODIV-01-20: Support to processes triggered by IPBES and IPCC' and 'HORIZON-CL6-2022-BIODIV-01-10: Cooperation with the Convention on Biological Diversity'.

drivers of biodiversity loss, and initiate, accelerate and upscale biodiversity-relevant transformative change in our society.

Digital technologies are transforming all sectors of society, from food production to mobility, energy, climate mitigation and adaptation measures, construction, infrastructure, technology use, human behaviour and societal organisation, with different impacts on and perceptions of biodiversity, due to the speed, scale and level of connectivity of these transformations. Projects should help identify a safe operating space, in which digitalisation and new emerging technologies generate no unsustainable rebound effects, but instead can be a vehicle for accelerating and amplifying the transition to a safe and just world for humankind whilst protecting, restoring and sustainably using biodiversity and ecosystem services.

Project should address all following outcomes:

- A better understanding, today and for the future, of the impacts on, risks and opportunities for biodiversity of digital transformation (for example smart technologies, artificial intelligence, automation, miniaturised sensors, citizen science applications, crowdsourcing), new materials (e.g. for biomimicry), and new and emerging technologies.

- Identification and an assessment of how system-level change affecting biodiversity through social innovation happens. This should cover bringing in new technologies, new production processes, consumer products, regulations, incentives, or participatory processes, and changes how socio-technical and socio-ecological systems operate.

- Making proposals for safeguards to build public understanding of the range of diverse values held by members of the public (i.e. indigenous communities, youth, women, vulnerable groups in society, socially or economically marginalised groups), to promote democracy and a socially just transition taking action on biodiversity. Proposals should promote incorporating these safeguards in transformative processes linked to the digital sector and technology, which can have positive or negative impacts on biodiversity and on the wide range of services ecosystems can provide.

- Demonstrating the potential of social innovation to tackle biodiversity loss, as well as using biodiversity and the ecosystem services it provides, with nature-based solutions as case studies. Demonstrating how nature-based solutions, enabled by social innovation, tackle poverty, low resilience and social inequality to achieve a just transition.

- Testing active intervention by R&I policy and sector policies (niche creation, reformulation of governance, 'exnovation'), also by empowering and endowing communities.

- Approaches, tools and knowledge influence policies provided at the right level on transformative change for biodiversity. The key elements for this change are to be delivered by the portfolio of cooperating projects (of which these projects form part).

Outcomes should be formulated in such a way that enables their potential users (policy makers, institutions, businesses, engineers, civil society) to understand and concretely apply them, including for monitoring, accounting and reporting purposes. The outcomes should be translated into options to ratchet up the targets and enabling mechanisms of the EU biodiversity strategy for 2030, the global post-2020 biodiversity framework, and to feed input into the processes on the Paris Agreement, the Sustainable Development Goals and IPBES. With the focus on the impacts and

opportunities of digital transformation, new emerging technologies and social innovation on biodiversity for the EU and associated countries, projects are strongly encouraged to engage in international cooperation, in particular with African countries, Brazil, Latin American and Caribbean countries or the Mediterranean region, in order to understand differences between the EU/AC and other world regions.

Scope:

- Proposals should generate, collect and distribute knowledge on how to tackle the indirect drivers of biodiversity loss linked to technological and social innovation, which includes digitalisation. They should also assess the impacts on biodiversity of the digital divide between urban, peri-urban and rural areas. Proposals should explain how changes in our societies are fostered by technological and social innovation impacting biodiversity – for example by bringing in new and emerging technologies, new production processes, consumer products, regulations, incentives, or participatory processes, which change how socio-technical and socio-ecological systems operate.

- Proposals are expected to contribute to informing stakeholders and users on the social and technological impacts of new and emerging technologies that are not covered by existing procedures for biodiversity-related risk assessments[34]. This includes the wider positive and negative impacts on societal values, behaviour, institutional, financial and business frameworks, which in turn are having an impact on biodiversity and the capacity of ecosystems to provide a wide range of services.

- Proposals should assess which tools further mainstream biodiversity into policy making, and governance (including financing, the promotion of innovation, and bringing in new and emerging technologies) to achieve transformative action that benefits biodiversity, to avoid, mitigate or manage conflicts linked to these transformational changes[35]. In doing this, proposals should engage with civil society, policy makers, finance and business leaders, to create a toolbox for transformative change via action on biodiversity.

- Proposals should build their analysis on the synergies between multiple Sustainable Development Goals to deliver both direct and indirect biodiversity benefits, staying within planetary boundaries, and on the role of biodiversity in reaching the set of Sustainable Development Goals. Proposals should factor in impacts and opportunities of digital transformation, new emerging technologies and social innovation on biodiversity. This explicitly includes the interdependence of biodiversity loss and climate change, and the impacts on biodiversity of digital, technological or social approaches on action to mitigate and adapt to climate change – and vice versa.

- Proposals should develop pathways for digital developments to achieve a successful twin digital and biodiversity transition. They should develop methodologies to assess their impacts (including the impacts from energy/electricity infrastructure, or on democracy and on trust in science) on environmental, social and economic systems. Such assessments should focus on the direct and

[34] Such as in the frame of the Convention on Biological Diversity and the Cartagena Protocol

[35] Referring to, and critically assessing, the understanding of transformative change in IPBES and GBO-5, EEA

indirect effects of digital developments on biodiversity, intertwined with climate change and health.

- Proposals should provide case studies and a collection of good and failed examples, including current relevant business models, the role of citizen science, and scenarios that could provide useful impact to these transformations and inform and inspire transformative change through learning, co-creation and dialogue.

- Proposals should include specific tasks and allocate sufficient resources to develop joint deliverables (e.g. activities, workshops, and joint communication and dissemination) with all projects on transformative change related to biodiversity funded under this destination. They should use existing platforms and information sharing mechanisms relevant to transformational change and to biodiversity knowledge[36]. Furthermore, projects are expected to cooperate with the Biodiversity Partnership and the Science Service. Proposals should show how their results and outcomes can provide timely information to major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), and to the Convention on Biological Diversity. They are expected to cooperate with projects 'HORIZON-CL6-2021-BIODIV-01-20: Support to processes triggered by IPBES and IPCC' and 'HORIZON-CL6-2021-BIODIV-2022-01-10: Cooperation with the Convention on Biological Diversity'.

- Where relevant, projects are expected to create links to and use information, data and impact-related knowledge from the European Earth observation programme Copernicus, the Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS).

HORIZON-CL6-2021-BIODIV-01-19: A mechanism for science to inform implementation, monitoring, review and ratcheting up of the new EU biodiversity strategy for 2030 ('Science Service').

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 11.00 and 13.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.

[36] BISE, Knowledge Centre for Biodiversity, BiodivERsA, Oppla, NetworkNature and their joint work streams

Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants to actions under point k) of the topic. The maximum amount to be granted to each third party is EUR 200 000, as actions under k) are key activities which the Science Service must deliver through the approaches laid out in its other actions, and to which the broad science community should contribute. Maximum 30% of the total requested EU contribution may be allocated to this purpose. The process of selecting entities for which financial support will be granted, within open calls for proposals to be evaluated by external, independent experts in a fair and transparent process must be defined in the proposal.

Expected Outcome: The project is expected to connect up biodiversity research across Europe, supporting and enhancing the ambition of national, European and international environmental policies and conventions.

Contributing to the EU biodiversity strategy for 2030, the aim of this topic is to give support for developing and implementing this and other EU policies by generating knowledge generation, guiding biodiversity governance and ecosystem monitoring, and implementing the EU Green Deal. It supports the development of a long-term strategic research agenda for biodiversity.

The project results are expected to contribute to all of the following expected outcomes:

- a single entry point linking European research and biodiversity policymaking that will be embedded in the EC Knowledge Centre for Biodiversity (KCBD) as 'scientific pillar', which will collect and organise knowledge resulting from science that is relevant for implementing the EU biodiversity strategy and other relevant EU policies, in particular knowledge generated from EU-funded R&I projects, relevant infrastructures and platforms.

- feeding input into the monitoring, reporting and review mechanism of the EU biodiversity strategy for 2030 with relevant research-based assessments and options that can feed into any short- and medium-term corrective action necessary ("ratcheting up").

- full integration into, and support to the governance framework of the EU biodiversity strategy for 2030 to steer implementation of the commitments on biodiversity agreed at national, European or international level.

- setting up a functional, early delivering Science Service at EU level, also involving associated countries where appropriate, to bolster at global level the EU's ambitions for research into biodiversity-relevant areas.

Scope: The EU biodiversity strategy for 2030 announced a science policy mechanism for research-based options to ratchet up the implementation of commitments made on biodiversity. This topic is to provide a Science Service as a dedicated tool to regularly integrate science into EU biodiversity policy-making in terms of what is needed to implement the strategy. It should bridge the continued

and critical gap on knowledge sharing and should complement other EU-funded initiatives[37]. It should feed into the EC Knowledge Centre for Biodiversity[38]. At the same time, it should provide a single-entry point linking RTD funded research and innovation with biodiversity policymaking via the EC Knowledge Centre for Biodiversity. Further, the Science Service might act as a pilot on how any science component could work in practice in the context of the post-2020 Global Biodiversity Framework. With this work, Europe could test and lead the way on how to make such an instrument, triggering research-based options to implement the biodiversity strategy, work in practice.

The objective is to reformat and connect research results to the needs of environmental policy in a targeted dialogue between science and policy makers. This should include science resulting from the latest EU R&I activities and infrastructures, shape future R&I and be embedded in the long-term strategic research agenda on biodiversity. Proposals should develop a Science Service mechanism that covers all of the following aspects:

a. Inspired by IPBES functions, it should provide relevant policy tools (e.g. indicators), generate knowledge to fill gaps, build capacity within and beyond the EU, and contribute to science-based assessments for the EU decision-making process.

b. All work carried out by the Science Service should be defined under strong and clear governance arrangements, including how to prioritise requests, and designed to support implementing, monitoring, reporting and reviewing the EU biodiversity strategy. The governance should be led by DG RTD, in cooperation with DG ENV, DG JRC and the EEA, and ideally involve the Environmental Knowledge Community (EKC)[39] and factor in its needs and requests.

c. The Science Service should feed into the EC Knowledge Centre on Biodiversity[40] and support it to direct knowledge gaps and policy questions to science, synthesize knowledge, and communicate emerging issues identified by science to decision-makers in policy, business, NGOs, land users or site managers. The Science Service should also be involved and feed knowledge into strategic dialogues and fora organised by the EC Knowledge Centre for Biodiversity, as well as in expert meetings requested by the EKC. The Knowledge Centre on Biodiversity should manage exchanges from policy to science and vice-versa, and the Science Service constitutes its primary tool for making scientific information accessible to policy makers.

d. Member States, and where appropriate associated countries, civil society and the Mission Boards under Horizon Europe, may also ask the Science Service to cover specific topics. The process of directing requests for contents and format to the Science Service, and how to provide information, is to be agreed with the relevant EU services, including with the EC Knowledge Centre for Biodiversity.

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37 Knowledge Centre for Biodiversity, Biodiversity Partnership, Horizon Europe's large-scale missions, further projects funded by R&I within this work programme.

38 The EC Knowledge Centre for Biodiversity (KCBD) is an action of the EU biodiversity strategy for 2030. It aims to enhance the knowledge base, facilitate its sharing and foster cross-sectorial policy dialogue for EU policy making in biodiversity and related fields. https://knowledge4policy.ec.europa.eu/biodiversity_en.

39 The Environmental Knowledge Community (EKC) is a collaboration between different services of the European Commission (EC) and the European Environment Agency (EEA) to exploit new ways of creating and exchanging knowledge that is related to environmental policy-making.

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e. The Science Service should use the tools and results funded by the EU research framework programmes[41], by other sources of European funding[42], and additional relevant sources[43], which it should help integrate into the EC Knowledge Centre for Biodiversity. It should cooperate with the European partnership on biodiversity[44].

f. The Science Service should take up requests from biodiversity policy-making to the Biodiversity Partnership, and to the biodiversity-relevant missions in Horizon Europe. This would be orchestrated in collaboration with the EC Knowledge Centre for Biodiversity; such as via its user forum function. The Science service should also organise ad-hoc high-level expert advice to the European Commission's high-level decision-makers on specific issues related to biodiversity.

g. The work of the Science Service should be presented and discussed at expert or working groups according to the governance framework of the EU biodiversity strategy, and should support European research policy related to biodiversity. It should also act as a 'back office' for organising the cooperation of biodiversity-relevant research projects – in thematic clusters where appropriate – under Horizon Europe and Horizon 2020, such as yearly meetings or through common products, in collaboration with the Executive Agency. This would be done in collaboration with the EC Knowledge Centre for Biodiversity.

h. The Science Service should support the orchestration of current and future knowledge mechanisms to implement the long-term European strategic biodiversity research agenda, including work under the Biodiversity Partnership and other biodiversity-relevant partnerships; such as EKLIPSE, Oppla, NetworkNature, the EC Knowledge Centre for Biodiversity[45] and other biodiversity-relevant science advisory mechanisms. It should also describe the global aspects of its services in the mid-term planning.

i. Proposals should indicate what specific results the Science Service should initially deliver by the end of year one. This pilot exercise should be relevant to and fit the timeframe set out in the policy agenda of the EU biodiversity strategy, and optionally, for the global biodiversity agenda. Throughout the duration of the project, the following annual work plans should be aligned to the long-term strategic research agenda (in preparation - See EU biodiversity strategy).

j. The Service should then deliver, communicate and disseminate regular (e.g. half-yearly) input in the form of options and scenarios for implementing the biodiversity strategy for 2030 and beyond. The aim must be to trigger response from those entities responsible for implementing

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41 e.g. directly EU-funded or co-funded projects by Joint Programming Initiatives, ERA-Nets, the European partnership on biodiversity

42 Such as funding under the Multi-annual financial framework (e.g. LIFE or COST, regional and cohesion, agricultural and rural development, fisheries and maritime, climate, social, just transition funding, neighbourhood, international cooperation), or under the Recovery Fund.

43 This covers e.g. relevant ESFRI's research infrastructures and Global Biodiversity Information Facility (GBIF) national nodes, biodiversity-relevant knowledge and data from citizen science, businesses, NGO, earth observation (linked to Galileo and Copernicus), governance processes, in order to increase the value and return-on-investment.

44 https://www.biodiversa.org/1759

45 The EC Knowledge Centre for Biodiversity (KCBD) is an action of the EU biodiversity strategy for 2030. It aims to enhance the knowledge base, facilitate its sharing and foster cross-sectorial policy dialogue for EU policy making in biodiversity and related fields. https://knowledge4policy.ec.europa.eu/biodiversity_en.

the strategy (e.g. EU services, national and local authorities, business, civil society and the environmental knowledge community in general).

k. It should provide, on request of its governance bodies, summaries, knowledge synthesis, factsheets or briefs and reviews of biodiversity research outputs and tools usable for implementing and ratcheting up the EU biodiversity strategy, in language and format tailored to the target users, such as:

   i. foresight, analysis of new and emerging topics,

   ii. indicators and valuation methods,

   iii. analysis of the behavioural, institutional and bio-physical factors for biodiversity conservation and restoration, including on tipping points and planetary boundaries,

   iv. projections/forecasts, integrated models, scenarios and pathways that integrate socio-economic and cultural values, that avoid lock-in pathways, and that provide incentives for large-scale demonstration of nature-based solutions and testing of governance approaches, financing and business models to enable transformative change,

   v. requests to existing science-policy services (such as EKLIPSE and Oppla) in collaboration with the EC Knowledge Centre for Biodiversity for dedicated biodiversity-relevant science-policy tasks that those services can deliver, and that the Science Service channels into the biodiversity governance framework,

   vi. support for science-based decision-making for biodiversity against disinformation campaigns; and

   vii. testing new ways of communicating biodiversity-related science to non-scientific audiences.

l. Proposals should describe how the Science Service can deliver its work in line with the timeframe for policy processes and to implement the EU biodiversity strategy. They should explain how they have sufficient resources, and a flexible, lean mechanism following the principles of credibility, relevance and legitimacy, including whether internal assessments or peer reviews on its outputs are planned.

m. Proposals should evaluate the experience of comparable instruments covering some of the actions or procedures that the Science Service should set up[46], focused on biodiversity but also in other fields, and under the governance framework of the EU biodiversity strategy.

n. The project should draw up a plan on how to finance and govern the activities of this kick-starting service over the medium- and long-term and seek to secure commitments to allow the work of the Science Service to continue after the funding of this topic ends, i.e. before 2027.

Proposals should strike an appropriate geographical balance across Europe.

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[46] such as IPBES, IPCC, EEA (the European Environment Agency), SCAR (Standing Committee on Agricultural Research), EPBRS (European Platform for Biodiversity Research Strategy), SfEP (Science for Environment Policy), SAM (the European Commission's Scientific Advice Mechanism), EPRS (European Parliamentary Research Service) or the UK's Climate Change Committee.

This topic should involve contributions from the sciences and humanities disciplines.

Destination 2 – Fair, healthy and environmentally-friendly food systems from primary production to consumption

HORIZON-CL6-2021-FARM2FORK-01-01: Reaching the farm to fork target: R&I scenarios for boosting organic farming and organic aquaculture in Europe

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: A successful proposal should support the farm to fork's strategy objective of a transition to fair, healthy, climate-resilient and climate- and environment-friendly food systems from primary production to consumption, notably the target of at least 25% of the EU's agricultural land under organic farming by 2030 and a significant increase in organic aquaculture, by evaluating the conditions and proposing scenarios relating to knowledge and innovation for reaching this target.

Project results are expected to contribute to all of the following expected outcomes:

- Support for the implementation of the common agricultural policy (CAP), the EU organic farming regulation and the action plan for the development of the organic sector in the EU;
- Robust evidence on the socio-economic scenarios and market analysis of organic (crops and livestock) farming and aquaculture and food systems across the EU and Associated Countries for reaching the target of at least 25% of the EU's agricultural land under organic farming by 2030 and a significant increase in organic aquaculture;
- Increased and coordinated research and innovation (R&I) investments in the organic sector;
- Improved exchange of knowledge and best practices on organic (crops and livestock) farming and aquaculture production, and increased availability of advisory services and capacity building,

leading to an innovation ecosystem in the EU and Associated Countries that is fit to support the achievement of the farm to fork target on organics.

Scope: The EU is taking a leading role in promoting organic farming and aquaculture and organic food production systems, ensuring high quality standards and developing new value chains. One of the goals of the farm to fork strategy is to reach at least 25% of the EU's agricultural land under organic farming by 2030 and a significant increase in organic aquaculture. This significant increase needs to be accompanied by a similar increase in the organic market. However, the current distribution of organic farming and aquaculture in the EU and Associated Countries is uneven, and there is a need to understand better the obstacles that prevent their development. A number of factors need to be in place for this increase to happen. Among those, research to identify the possible socio-economic impacts on organic producers and on other operators of the value chain, as well as empowering the organic (crops and livestock) farming, aquaculture and food sectors, are essential. Networking and the coordination of research and innovation activities among all relevant actors in the organic farming and aquaculture sectors can ensure the strategic thinking, mobilisation of resources and sharing of knowledge and best practices that are needed to strengthen the organic R&I ecosystem in the EU and Associated Countries, in order to support the achievement of these objectives.

Proposals should evaluate the constraints and lock-ins for reaching the farm to fork strategy target on organics, and the necessary facilitating environment. Proposals should analyse the uptake of organic (crops and livestock) farming and aquaculture across the EU and Associated Countries and the reasons for their varied uptake.

As part of a foresight exercise, proposals should set out scenarios showing where the expected increase can be achieved, and analyse the socio-economic impacts on existing and new organic producers and other market players.

Proposals should assess various actors' knowledge needs when it comes to enhancing innovation towards greater adoption of organic farming and aquaculture, so that the target of the farm to fork strategy can be reached. Proposals should promote capacity building and ensure the necessary sharing of knowledge and best practices among organic (crops and livestock) farmers, aquaculture producers, advisors, scientists and other operators in the value chain, building on existing tools where relevant and available.

In undertaking these activities, proposals should promote close cooperation among relevant research and innovation actors across the EU and Associated Countries, ultimately leading to a more efficient organic production R&I ecosystem. As such, proposals should help to preserve and continue existing communities of research providers and research funders, and widen them to include other public or private actors.

Proposals must implement the 'multi-actor approach' and ensure a value chain approach, with adequate involvement of the organic farming and aquaculture sectors.

Collaboration should be ensured with other relevant EU-funded research projects and initiatives under Horizon 2020 and Horizon Europe, including the relevant Horizon Europe partnerships and networking initiatives.

This topic requires the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-02: Developing sustainable and competitive land-based protein crop systems and value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 5-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal should support the farm to fork's strategy objective of a transition to a fair, healthy and resilient EU agriculture sector, in particular the goal of fostering EU-grown plant proteins, in line with the ''Report on the development of plant proteins in the EU''[47]. Activities should support the transition to sustainable, productive, climate-neutral and resilient farming systems that minimise pressure on ecosystems, while ensuring fair economic returns for farmers and food consumption that is sustainable in terms of both health and the environment.

Project results are expected to contribute to all of the following expected outcomes:

- Identification of the most suitable regional and local transition paths for stimulating sustainable, resilient and economically viable land-based protein crop production for food and feed in the EU and Associated Countries, resulting in increased commercial production of such crops and enhanced food security in the context of protein requirements in the EU and Associated Countries;

- Improved, robust evidence of the social, economic, environmental, climate and health benefits and costs of increasing land-based protein crops production;

- Improved capacities of farmers to cultivate land-based protein crops through innovative advisory tools, improved and wider exchange of knowledge and best practice, adoption of sustainable crop rotation practices and collaboration with other actors in the value chain;

- Stronger innovation ecosystem for land-based protein crop development in Europe through multi-stakeholder and transdisciplinary intra-regional, trans-regional and trans-national collaboration and networking.

[47] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0757

Scope: Land-based protein crops[48] are a source of food, feed and environmental services and have an increasingly important role to play in the transition to more sustainable farming systems that provide economic, environmental and social benefits. In view of the increase in protein demand, the sustainable diversification of protein sources in the EU and Associated Countries needs to be explored and developed. Land-based protein crops have a significant role to play in this regard. However, due to a variety of factors, their production in the EU and Associated Countries is not sufficient to cover the growing demand for plant-based proteins. It is becoming necessary to develop and ensure more sustainable and resilient supply chains, and to promote higher consumer acceptance and attractive market opportunities. Specific measures are needed to realise the potential of land-based protein crops in the EU and Associated Countries.

Proposals should build on and expand existing knowledge in order to identify the most suitable transition paths for sustainable land-based protein crop production in different pedo-climatic regions, and to develop strategies for sustainable and competitive regional protein-based crop systems and agri-food and feed chains. Proposals should cover the diversity of available and novel land-based protein crop species with a crude protein content of more than 15%, and consider conventional, agroecological and organic farming systems in all European climate/biogeographical regions. Proposals must implement the 'multi-actor approach' and should ensure adequate involvement of farmers and all relevant actors in the value chain for land-based protein crops. Proposals should build on the results of relevant projects and thematic networks funded under Horizon 2020 and include a task to collaborate with the project(s) selected under the following topic in this work programme: *HORIZON-CL6-2021-FARM2FORK-01-12: Filling knowledge gaps on nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift*. In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Proposals should identify the most suitable transition paths for the development of sustainable new and existing land-based protein crop farming systems and agri-food and feed chains across the EU and Associated Countries. Proposals should explore the potential for value chain development, taking into consideration opportunities, constraints and impact of different tools, instruments and policies, on different value chain actors, using case studies of existing farms, networks of farms and producer organisations. Proposals should develop and test strategies for sustainable and competitive local and regional land-based protein crop systems that result in improved production techniques, cropping system design that promote crop diversification, feed efficiency, value chain development, reduced environmental impact and improved farmers' organisation, taking into account complementarity across regions and addressing regional imbalances. Proposals should document specific support needs (advice, knowledge and best practice sharing, etc.) for farmers seeking to cultivate protein crops in different regions, assessing the availability of specific tools and developing new, innovative ones. Building on existing tools or mechanisms where available and relevant, proposals should establish a transdisciplinary, multi-stakeholder EU and Associated Countries-wide network to facilitate trans-national and trans-regional sharing of knowledge and best practice in land-based protein supply chain management and agronomic practices, including facilitating cross-regional testing of varieties. Building on existing tools or mechanisms where available and relevant, proposals should establish regional multi-stakeholder networks for advisory services, awareness raising, the sharing of knowledge and best practice, experimentation and demonstration on land-based protein crops species that are best adapted to regional conditions. Proposals should analyse

[48] This topic focuses on protein rich plants with a crude protein content of more than 15 % (oilseeds: rapeseed, sunflower seeds and soya beans; pulses: beans, peas, lentils, lupins etc.; and fodder legumes: mainly alfalfa and clover), accounting for about 1/4 of the total crude plant protein supply in the EU.

the impact of climate change on land-based protein crops in various farming systems, and their contribution towards climate resilient farming and wider environmental benefits in relation to aspects such as biodiversity, input reduction, closing nutrient cycles, increased soil organic matter and improved soil health. Proposals should develop innovative measures for improving the impact of land-based protein crop production in terms of increased (agro-)biodiversity. Proposals should develop methods and indicators to compare the climate, environmental, social and health benefits and costs of greater land-based protein crop production and its industrialisation, considering the impact of policy measures on land-use changes and implications for farmers, in different farming systems and regions. Proposals should develop indicators to take into account and compare the further industrialisation feasibility and costs of the varieties considered. A method for the systematic collection of data on land-based protein crops for economic and environmental assessment should be developed.

HORIZON-CL6-2021-FARM2FORK-01-03: Digitalisation as an enabler of agroecological farming systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: A successful proposal should support the farm to fork's strategy objective of a transition to a fair, healthy and resilient European agriculture sector, in particular the goal of promoting agroecology, by improving understanding of the potential of digitalisation as an enabler of agroecology, a transformative, sustainable, healthy, resilient and inclusive approach to farming that can minimise farming pressure on ecosystems while generating fair economic returns for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- Robust evidence of existing innovative digital tools and technologies that specifically support the transition to agroecology for different crops, farming systems and pedo-climatic conditions;
- Improved understanding of the barriers, drivers, risks and usability aspects of digital tools that support the implementation of agroecological farming approaches for different crops and farming systems in different pedo-climatic regions;

- Greater awareness among different actors of the cost-effectiveness and the economic, environmental and social performance of digital tools that support the implementation of agroecology, as well as the barriers and incentives for their uptake and deployment;

- Pathways to address research and innovation (R&I) needs as regards digital tools that specifically support the transition to agroecology in the EU and Associated Countries.

Scope: Agroecology[49] is a holistic approach that relies on and maximises the use of ecological processes to support agricultural production. By working more with nature and ecosystem services, it has the potential to increase farms' circularity, diversification and autonomy, and drive a full transformation of farming systems and agricultural value chains, from input substitution and beyond. Agroecological farming systems therefore have great potential to enhance the sustainability performance of agriculture and agricultural value chains that contribute to the objectives of the EU farm to fork strategy. Compared to industrialised and most conventional agricultural production, agroecology brings a higher level of complexity to farming systems. Digital technologies and agricultural equipment can play a key role in improving the performance of agroecological approaches at farm and territorial level, and boosting their uptake by farmers, *inter alia* by supporting their decision-making on farming practices. These technologies, which include artificial intelligence, geo-spatial technology, advanced image analysis procedures, the internet of things (IoT), robotics and sensors, are available and can be applied to most farming approaches. However, agroecological farming systems are more likely to benefit from tailored digital technologies and technology portfolios that enable, for instance, ongoing monitoring of the transition of farming practices and their performance through databases of in-situ data, or support for farmers' decision-making through the integration of the different elements of an agroecological farming system in a holistic, system-based approach. The cost-effectiveness and performance of these solutions need to be evaluated in order to ensure they contribute to the effectiveness and sustainability of agroecological systems and to farm and/or landscape management. Activities should contribute to road-mapping for the improved productivity and sustainability performance of agroecological farming systems by assessing the availability of digital, data-based solutions tailored to agroecological farming and the potential to adapt "standard" digital technologies used in agriculture to the specific requirements of agroecological approaches for farm and landscape management. Due attention should be paid to aspects relating to security in the use of data, interoperability and the extent to which farmers and other actors in the food chain accept and are able to use these solutions.

Proposals should ensure that any data produced in the course of the project comply with the FAIR principles. Proposals should build on the results of relevant projects funded under Horizon 2020 and ensure collaboration with projects funded under the following calls in this work programme: *HORIZON-CL6-2021-CLIMATE-01-05: Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity* and *HORIZON-CL6-2022-FARM2FORK-02-01-two-stage: Agroecological approaches for sustainable weed management*.

Proposals should evaluate the need for such tools, and their implementation capacity for different crops and farming systems in different pedo-climatic zones, taking account of local natural habitat types. Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector.

Proposals should document specific needs for digital technologies to support agroecological farming approaches, at farm, territorial and regional / national level. Building on existing data bases of digital

[49] http://www.fao.org/3/i9037en/i9037en.pdf

technologies for agricultural production, proposals should assess the availability of tools tailored to agroecological approaches and identify gaps and needs for the adaptation of existing technologies or the development of new, innovative solutions to serve the needs of agroecological farming systems. Proposals should evaluate the cost-effectiveness of the solutions proposed, and assess their potential performance in agroecological farming systems for different crops, farming systems, biogeographical regions and pedo-climatic conditions. Proposals should analyse barriers to and incentives for the uptake and effective deployment of these tools, including analysis of cost effectiveness, risks, usability and affordability for farmers, as well as social and cultural obstacles. Based on this information, proposals should compile an open repository of available digital tools to address the specific needs of agroecological farming systems, including organic, under different pedo-climatic conditions. In collaboration with a wide range of stakeholders, including farmers, the private and public sector as well as consumer representatives, proposals should develop a roadmap for R&I on digital technologies to support agroecology in the EU and Associated Countries.

HORIZON-CL6-2021-FARM2FORK-01-04: Tackling outbreaks of plant pests

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 14.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the farm to fork strategy, for a transition to fair, healthy and resilient EU agriculture and forestry, including an ambitious target for the reduced use of plant protection products[50], proposals will support research and innovation (R&I) to help the agricultural / forestry sectors to remain productive and contribute to sustainable agriculture and/or forest health.

Project results are expected to contribute to all of the following expected outcomes:

- Find adequate responses to EU quarantine plant pests;
- Enhance capacities to prevent, monitor and (bio)control important plant pests;

[50] The farm to fork strategy sets the target to reduce by 50% the overall use and risk of chemical pesticides and reduce use by 50% of more hazardous pesticides

- Support to relevant EU and Associated Countries' plant health policies.

Scope: Proposals should target one or more plant pest(s)[51] that are either Union quarantine plant pests[52] present in the EU or Union quarantine pests which are priority pests [53] in the EU, and that are of concern for agriculture and/or forestry. They should improve methods and strategies for surveillance and control, and extend the range of tools for integrated and effective pest management.

Proposals should:

- Contribute to the understanding of the drivers of plant pest spread and establishment including the influence of climate change, ecosystem degradation, and globalisation.
- Develop efficient surveillance methods and strategies for early-detection and (bio)control of the pest(s).
- Extend the range of tools and technologies available for the development of economically and environmentally sound solutions for effective pest management in farming and forestry in line with the principles of integrated pest management.
- Analyse the social and economic implications for farmers affected by the plant pest(s) and developing approaches whereby those affected can best cope with the situation.
- Analyse the ecological impact of plant pest(s) spread and establishment.

International cooperation with countries affected or threatened by the same pest(s) is strongly encouraged. Proposals should consider both the conventional and the organic sectors. Proposals must implement the "multi-actor approach" including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services and farmers/foresters are brought together.

The possible participation of the JRC in the project will consist of supporting the analysis of social and economic implications for farmers affected by the plant pest(s) and developing approaches on how to best cope with the situation when affected.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-FARM2FORK-01-05: Animal welfare 2.0

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

[51] A pest is defined here as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (EU legislation, Regulation 2016/2031)

[52] See part B of Annex II to Commission Implementing Regulation 2019/2072 for pests known to occur in the Union territory

[53] See Annex to Commission Delegated Regulation (EU) 2019/1702 for priority pests.

Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the farm to fork strategy, for a transition to fair, healthy and resilient livestock production systems, including the improvement of animal welfare and reduction of anti-microbial usage, a successful proposal will support research and innovation (R&I) to help policy makers and other actors (e.g. economic operators) monitor and improve animal welfare in intensive and extensive systems, thus contributing to sustainable agriculture.

The project results are expected to contribute to all of the following outcomes:

- Improved capacity to evaluate and monitor the state of animal welfare in a region/country or in relation to a group of operators;
- Enhanced capacity to further improve animal welfare by business operators or decision makers, through provision of best practices and innovative tools and
- Enhanced capacity to integrate the environmental and socio-economic impact of proposed practices and innovations.

Scope: Farming and food production data are collected at different stages of the production process of terrestrial livestock, mostly to improve economic efficiency, disease control, food safety and quality. Few data collected on farms or during subsequent processing (e.g. in slaughterhouses or dairies) are used to monitor the welfare state of the animals and the different levels of welfare. This can be done through a combination of diverse sources of data already collected and more intensive collection through automatic systems, or routine sampling. At present, even where data are used for animal welfare purposes, they are often exploited only at individual farm level or for just a few operators. The development of algorithms to interpret the various types of data that are collected could increase their value in relation to animal welfare. This would be beneficial both at farm level and in broader contexts, e.g. among groups of operators, or at regional, national, or EU levels.

Proposals should address all of the following areas of research in terrestrial livestock:

- Identification of the data and appropriate indicators that enable assessment of animal welfare on farms, during transport and at the time of slaughtering/killing;
- Development of innovative ways of automatically collecting data pertaining to welfare and related sustainable farming techniques;
- Standardisation of data collection for a population of operators along the supply chain;
- Development of algorithms integrating heterogeneous data from a population of operators in order to evaluate the level of animal welfare within the population concerned;

- Development of best practices associated with statistically meaningful improvements in animal welfare (i.e. associated with improved indicators at population level);
- Evaluation of the environmental and socio-economic impacts of best practices for animal welfare, including marketability;
- Development of monitoring tools and smart models to improve the scope of the data collection both quantitatively (population size) and qualitatively (quality of data collected and impacts measured); and
- Development of innovative ways to estimate the impact of past detrimental conditions on welfare.

The choice of the population of operators should take into account their economic and social relevance for the EU policy and regulatory framework, and potential animal welfare issues (to be addressed both quantitatively and qualitatively). The choice of data studied should take into account complementarity, frequency and ease of collection (automation or routine sampling). It should also take account of the various dimensions of animal welfare (feed and water, comfort, health, behaviour, etc.). Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector, the veterinary profession, agricultural advisory services and other relevant actors along the food chain.

HORIZON-CL6-2021-FARM2FORK-01-06: Vaccines and diagnostics for priority animal diseases

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: In line with the farm to fork strategy, for a transition to fair, healthy and resilient livestock production systems, including the reduction of anti-microbial usage, a successful proposal will support research and innovation (R&I) to help policy makers and economic operators reduce the burden of infectious animal diseases, thus contributing to a sustainable livestock industry and public health (food safety, zoonoses, anti-microbial resistance).

The project results are expected to contribute to all of the following outcomes:

- Enhanced capacity to prevent or control relevant priority diseases, through the provision of innovative tools and products to policymakers, the veterinary profession and business operators; and

- Increased knowledge of virulence factors, mechanisms of infection and protection and identification of protective antigens needed for effective vaccine development.

Scope: Vaccines and diagnostics are essential components of the toolbox for preventing and controlling infectious animal diseases and limiting their impact, including the potential reduction of anti-microbial usage. The development or improvement of vaccines for regulated diseases may not be attractive for the pharmaceutical industry and public support may be needed because of market failure. It is important that the toolbox includes early, fast and reliable diagnostics, which may go hand in hand with vaccination (e.g. DIVA tests). New developments in science and technology (e.g. genomics, artificial intelligence) enable a fresh approach to vaccine and diagnostic development.

Proposals should address, for terrestrial livestock and relevant wildlife, improvements in vaccine technologies (e.g. adjuvants, stability and administration), products (e.g. new/improved vaccines, vaccines addressing multiple pathogens), underpinning knowledge (virulence factors, infection and protection mechanisms, protective antigens necessary for effective vaccine development) and related diagnostics, and look into the feasibility of vaccine production based on existing or novel vaccine platforms. Use of artificial intelligence to decipher target antigens is encouraged.

Diagnostics for infectious diseases in terrestrial livestock and related domains is recommended, for instance to set animal-specific clinical breakpoints for susceptibility of key veterinary pathogens for which disease-specific breakpoints are unavailable and generic breakpoints based on antimicrobial concentrations in serum are not relevant. Point-of-care and multi-pathogen diagnostic tools are particularly helpful for strengthening surveillance and capacity to respond to threats.

The choice of infectious agents / diseases should take into account their importance for EU policy and regulation, e.g. by virtue of being responsible for epizootic diseases such as African swine fever, African horse sickness, or being priority zoonotic diseases, contributing to anti-microbial resistance, or having serious socio-economic impacts more generally. Proposals may use priorities identified under OIE[54], in EU animal health law, or by the SCAR Collaborative Working Group on Animal Health and Welfare[55], Discontools[56], or the STAR-IDAZ International Research Consortium[57].

Participation of industry is highly recommended.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

International research cooperation with institutions outside the EU is welcome insofar as it brings clear added knowledge, value and expertise to the project and maximises the impact.

Proposed research should take into account other EU funded projects, including those funded under ICRAD ERA-NET[58].

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54 https://www.oie.int/fileadmin/SST/adhocreports/Diseases%20for%20which%20Vaccines%20could%20reduce%20Antimicrobial%20Use/AN/AHG_AMUR_Vaccines_Apr2015.pdf and https://www.oie.int/fileadmin/Home/eng/Internationa_Standard_Setting/docs/pdf/SCAD/A_SCAD_Sept2018.pdf (annex8 p;46)

55 https://www.scar-cwg-ahw.org/wp-content/uploads/2018/04/Final-Report-CWG-AHW-CASA_updated-EU-AH-SRA.pdf

56 www.discontools.eu

57 www.star-idaz.net

58 https://www.icrad.eu/

HORIZON-CL6-2021-FARM2FORK-01-07: Research & innovation roadmap for blockchain technologies in the agri-food sector

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Legal entities established in non-associated third countries may exceptionally participate in this Coordination and support action.

Expected Outcome: In line with the farm to fork strategy and the headline ambitions of a 'digital age' and 'economy that works for people', leaving no one behind, the successful proposals will support increased traceability and transparency in food supply chains and support the implementation of sustainability schemes. They will therefore contribute to the ambition of developing sustainable, productive and climate-neutral, biodiversity-friendly, and resilient farming systems providing consumers with affordable, safe, healthy and sustainable food, minimising pressure on ecosystems, improving public health and generating fair economic returns for farmers through the exploration and development potential of the use of blockchain in the agri-food sector.

Project results are expected to contribute to all of the following outcomes:

- enhanced transparency and traceability in agri-food supply chains, including "green supply chains" through blockchain technologies;
- contributing to increasing competitiveness and market power of producers, including through smart contracts;
- reduce transaction costs and administrative burdens in the field of agri-food management for public and private actors through blockchain technologies and dedicated tools;
- capacity building in Research & Innovation (Infrastructure), in the agri-food sector and public administration for the development, assessment and application of blockchain technologies in the field of agri-food;
- excellence in research and innovation in blockchain technologies in the agri-food sector in Europe through networking of actors and initiatives.

Scope: The potential of blockchain technologies across sectors and fields of application has been widely acknowledged and is driven in private and public domains. Also in the area of agri-food, blockchain technologies have raised interest, but are not yet applied in mainstream mode. On the one hand, the area of agri-food induces special challenges to the application of blockchain

technologies, such as the nature of products; on the other hand, the sector is predestinated for tracking technologies. As pointed out in the European Commission`s Green Deal, and the farm to fork strategy in particular, transparency and sustainability efforts in the food supply chain are to be increased and power between actors to be balanced. Blockchain technologies can not only support traceability ambitions, but also support the implementation of organic or other (sustainability-related) labelling schemes as well as sustainable finance and climate mitigation and/or biodiversity-friendly schemes, and smart contracts, track information for consumers, and reduce administrative burdens for the public administration

A new level of ambition is needed to tackle research and innovation (R&I) in the field of blockchain technologies in the agri-food sector, thereby generating the necessary knowledge and solutions to enhance the development and application of blockchain technologies in the agri-food sector in the private and public domain and develop the relevant capacities to foster this R&I objective in the short, medium, and long term. Experiences from the application of blockchain technologies in others sectors and areas are to be capitalised.

Activities should create an effective framework for action, which is expected to allow pooling resources, coordinating efforts and developing a coherent portfolio of R&I activities in the wider area of blockchain technologies in the field of agri-food following an integrative and de-fragmented systemic approach. This should include:

- mapping and assessing existing blockchain technologies related European and international R&I activities and promoting their coordination in the field of agri-food; where relevant, initiatives and approaches developed in / for other sectors / fields of application with the potential of being transferred to the agri-food sector might be mapped as well;

- assessing the extent of application of blockchain technologies in the agri-food sector in the EU and globally including the extent to which blockchain technologies meet EU and international regulatory requirements, and draw lessons learnt, benefits and shortcomings/ disadvantages;

- analysing the needs for R&I on blockchain technologies in agri-food as expressed through stakeholder consultation and on-going research projects;

- identifying gaps, priority areas and types of action for intervention;

- proposing methodologies to monitor and review a portfolio of blockchain technologies related R&I activities in the field of agri-food.

Funded activities are expected to increase European capacities (technical, organisational) for implementing a major R&I programme on blockchain technologies in the agri-food sector. This results in:

- a roadmap for R&I on blockchain technologies in the agri-food sector in Europe developed following the concept of "co-creation" with a wide range of stakeholders, including the private and public sector as well as consumer representatives;

- improved coordination with existing activities in Europe and globally, thereby raising visibility and effectiveness of R&I funding going beyond EU-funded initiatives and including e.g. also nationally or regionally or privately supported actions;

- identification of potential "flagships" for testing and demonstrating solutions on key actions from a producer, processor, consumer, investor and public administration perspective under consideration of experiences gained/ approaches developed in other sectors;

- informed development of policies, supported development of relevant policies, and facilitated harmonisation and coordination between decision-making levels.

Proposals should cover all of the following aspects:

- development of innovative, cost-effective and resource-efficient blockchain-based approaches (including systemic approaches) to increase the traceability of agricultural products taking local, regional, national, European and global supply chains as reference point considering private and open blockchain networks.

- development of innovative approaches reflecting on the environmental, socio-economic and practicability implications of the application of different blockchain approaches considering at least the situation in the EU and developing countries.

- giving special attention to the capacities of (small) farmers and processors and actors in third countries in the deployment of blockchain technologies, as well as to private and public (sustainability-related) labelling schemes, organic and climate- and biodiversity-friendly production, sustainable finance, food safety, food safety emergencies, detection of non-authorised substances, border controls and consumer benefits, and fraud prevention.

- identification of possible new application areas for blockchain technologies in the area of agri-food; possible spill-over effects to related application fields, such as bio-based value chains.

- development of innovative resource efficient approaches to reduce transaction costs and administrative burden for producers and the administration (for organic products).

- development of suitable R&I programmes to deliver the knowledge, technologies and practices needed to achieve the aforementioned expected outcomes.

- establishment of links to relevant actors and organisations, including to Digital Innovation Hubs, the European Blockchain Partnership and the EU Blockchain Observatory.

Proposals are expected to demonstrate how to liaise with Cluster 4 activities as regards the development of cross-sectoral technological developments of blockchain solutions and reflect on their potential for the agri-food sector, e.g. in the fields of blockchain-based Internet of Things network management, authentication and access controls methods and novel decentralised analytics.

International cooperation is strongly encouraged.

HORIZON-CL6-2021-FARM2FORK-01-08: Uncovering lock-ins and levers to encourage farmers to move to and stay in sustainable, climate-neutral and biodiversity-friendly farming systems: from experiments to systemic mechanisms

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.

Expected Outcome: In line with the Green Deal, notably the farm to fork and biodiversity strategies, climate action, zero pollution ambition and the common agricultural policy (CAP), the successful proposals should support the development of policies, business models and market conditions that enable sustainable, productive and climate-smart agricultural systems. The farming systems should provide consumers with healthy and sustainable food affordable for all, improving public health, minimising pressure on ecosystems, enhancing biodiversity, and generating fair economic returns for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- improved understanding of challenges and opportunities for the development of sustainable, climate-neutral, biodiversity-friendly farming systems at the farm and landscape levels;
- improved understanding of farmers' individual (behavioural/decision-making) and systemic 'lock-ins' and 'levers' for moving to and staying in sustainable, climate-neutral and biodiversity-friendly farming systems;
- improved understanding of consumers' behaviour (decision-making) and market segmentation with regard to buying food from sustainable, climate-neutral and biodiversity -friendly farming systems;
- improved understanding of behaviour (decision-making) of upstream and downstream operators in agri-food value chains and other relevant actors across food systems with regard to hindering/facilitating transition to sustainable, climate-neutral and biodiversity-friendly production and consumption systems;
- better design and implementation of relevant policies, in particular the CAP, the farm to fork and biodiversity strategies, that effectively incentivise large-scale and long-term behavioural shifts by farmers to sustainable, climate-neutral and biodiversity-friendly farming systems;
- improved farm advice, business strategies and relationships building on common interests among relevant food systems operators and actors across sectors, helping farmers to produce in a more sustainable manner, contributing to climate neutrality and reversing biodiversity decline; and

- improved capacities of researchers in behavioural and experimental research, and systems thinking.

Scope: Although the EU has made strides in improving the sustainability of agriculture, substantial efforts are still needed to achieve the ambitious targets of the European Green Deal, in particular the farm to fork strategy and the objectives of the future CAP. Many emerging approaches, such as agroecology[59] (including organic farming), etc., have the potential to make farming systems more sustainable in climate, environmental, economic and social terms. However, multiple 'lock-ins' are preventing farmers from scaling the transition up and out to more sustainable production systems. Policy and business shifts are needed to help them escape from the 'lock-ins' and change at the requisite pace. An in-depth understanding of farmers' 'lock-ins' and 'levers' is key to spurring large-scale and lasting shifts to sustainable farming systems. Behavioural and experimental research that unpacks the decision-making involved in adopting sustainable practices holds significant potential when it comes to identifying 'lock-ins' and 'levers', thereby improving the effectiveness of the CAP and contributing to the successful implementation of the farm to fork strategy. In addition to unpacking the pieces of the behavioural (decision-making) puzzle, it is important to compile a wider, more comprehensive picture of the food systems in which farmers operate and of their governance, structures, mechanisms and dynamics that lock them into unsustainable practices or incentivise them to take and stay on a sustainable path.

Proposals should investigate farmers' decision-making (behaviour) and the broader food systems in which they have to operate (and/or create collective action), so as to uncover what locks them into unsustainable practices and what incentivises them to move to and stay in sustainable production systems. Attention should be paid to the full range of decision-making factors (e.g., behavioural, economic/regulatory, knowledge, biophysical, gender, cultural, etc.) and food systems' structures, mechanisms and dynamics (e.g., feedback loops, trade-offs and synergies, etc.).

Proposals should take a comprehensive behavioural approach and investigate proximal and distal factors to understand farmers' behaviour (decision-making) better, in order to inform the design and implementation of policies (in particular the CAP) and the European Green Deal initiatives (in particular farm to fork and biodiversity strategies). Extensive experimental research should cover, for instance (but not limited to) 'nudges', voluntary schemes or mandatory regulation, to fill gaps in policy-oriented research and support effective, evidence-based policy design and implementation.

It is also important to analyse behaviour (decision-making) of other food system actors and their role in/influence on hindering or incentivising farmers' decisions as to whether to adopt and maintain sustainable practices in the long-term. To this end, proposals should thoroughly analyse consumers' preferences (habits, choices), decision-making and shopping behaviour, in particular looking at market segmentation and willingness to pay *versus* buying acts, in various contexts. This knowledge should be shared broadly with farmers, so that they can respond better to changes in consumer demand, which is a strategic CAP objective. In addition, proposals should explore the behaviour (decision-making) and actions of downstream and upstream operators in agri-food value chains (e.g., input industry, food companies, retailers, hospitality industry, etc.) and other relevant food system actors that lock farmers in unsustainable practices or enable/encourage them to adopt sustainable practices and stimulate or hinder consumer demand for more sustainable food.

With an interdisciplinary lens, proposals should also consider the 'whole-systems' in which farmers operate and analyse the systemic mechanisms, structures and dynamics that lock farmers (and

59 http://www.fao.org/3/i9037en/i9037en.pdf

landowners) into unsustainable states and ways to break away, build collective interest for and incentivise them to move to and remain in sustainable farming systems.

Concurrent research should be conducted using the same (or similar) methods in a variety of settings representative of the diversity in agri-food systems and conditions in the EU and Associated Countries (e.g., a wide range of farm typologies, diverse farming systems, including (but not limited to) various agroecological approaches and organic farming, sectors/value chains, collective actions, regions and communities, etc.) in order to be able to derive meaningful conclusions on the general validity of decision-making (behavioural) factors and systemic insights across countries and contexts.

Proposals should also explore and propose ways to engage diverse food system operators and actors (e.g., through innovative policies, improved farmers' organisation, social innovation or new business models, etc.), in enabling farmers to move to and stay in sustainable farming systems.

Based on the research results, proposals should formulate and disseminate widely to relevant actors:

1. policy recommendations and innovative policy options, in particular for the CAP, environmental policies, and relevant Green Deal initiatives; and

2. business strategies (including the identification of end markets for sustainable products on a cross-sectoral basis);

for encouraging farmers to lastingly adopt sustainable practices and progressively raise their sustainability performance.

The possible participation/contribution of the JRC in the project would consist of being involved in the selection of policies, business models and market conditions to be tested, the design of the experiments and the formulation of the policy recommendations.

Proposals should build and expand on the achievements of past and current research and innovation (R&I) projects, e.g., those funded under topic SFS-29-2017[60]. Collaboration with future projects to be selected under topic HORIZON-CL6-2021-FARM2FORK-01-09 is encouraged. This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-12: Filling knowledge gaps on the nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 11.00 million.
Type of Action	Research and Innovation Actions

60 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/sfs-29-2017

Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environment-friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposal will support R&I to promote the production, provision and safe consumption of alternative sources of protein, and dietary shifts towards sustainable healthy nutrition, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, sustainable healthy nutrition and safe food, food poverty reduction, empowerment of communities, and thriving businesses.

The farm to fork strategy states that '[a] key area of research will relate to (…) increasing the availability and source of alternative proteins such as plant, microbial, marine and insect-based proteins and meat substitutes'.

While information already exists on the environmental and climate-related benefits of a dietary shift to alternative proteins, more R&I is needed to obtain a comprehensive and up-to-date understanding of the environmental footprint and sustainability performance of alternatives (e.g. plant-based, microbe-based, ocean-based (i.e. fish, algae, invertebrates), fungus-based, insect-based, cultured meat) compared to conventional sources of protein (e.g. meat and dairy) and dietary shifts. There is also a need for further research on the positive and negative impacts of alternative protein sources in European diets on human health (e.g. food allergies) and their bioavailability (along with other characteristics such as structure, colour, taste and flavour). It is presumed that a shift to alternative proteins should lead to healthier and overall more sustainable diets, but this depends on the nature of the shift (e.g. shifting from processed meat to another nutrient-poor, highly processed protein source might not provide the desired health benefits).

Projects results are expected to contribute to all of the following expected outcomes:

- informing a systemic approach to integrated food policy development and informing sectoral policies (e.g. on food safety, public health, agriculture, aquaculture and the environment) through additional, up-to-date information and knowledge on alternative sources of protein and dietary shift; and

- providing solutions and assessing their potential for fighting climate change (through adaptation and mitigation), halting biodiversity loss and improving ecosystem services, promoting the circularity of the food system and improving people's health and well-being through more nutritious, healthier and overall sustainable food systems and food choices.

Scope: Many studies (e.g. IPCC, EAT-Lancet) have highlighted the large environmental impact of traditional livestock production and consumption of products thereof, and the need for and benefits of a dietary shift to alternative protein sources. For example, switching from meat and dairy to alternative sources of protein could lead to savings in land use (plant alternatives need less land per

unit of protein; aquatic animals generally have a high production per area), better animal welfare and less deforestation for food production. Excessive consumption of livestock-derived products could also lead to a decline in health. The World Health Organization (WHO) has classified processed meat as carcinogenic to humans and red meat as probably carcinogenic to humans. An Oxford University model specifies that switching to diets made of alternative protein sources (e.g. algae, insects, plants, fungi) reduces diet-related mortality by 5-7%, due to increased consumption of dietary fibres[61]. However, a concern regarding novel foods (especially those containing proteins) is the likelihood of food allergies.

Proposals are expected to address the following:

- consider all alternative sources of protein (e.g. plant-based, microbe-based, ocean-based (i.e. fish, algae, invertebrates), fungus-based, insect-based, cultured meat), including their processing, and avoid focusing on only one, so as to enable comparison;

- fill knowledge gaps and improve our understanding of the positive and negative impacts of each type of alternative protein and the overall dietary shift with respect to the environment, natural resources, biodiversity and climate (considering global aspects, pedo-climatic and biogeographical conditions, pollution pressure and trade issues);

- fill knowledge gaps on the characteristics of each type of alternative protein, including nutritional quality (e.g. bioavailability, the quality of the protein itself and of combined protein sources), alone and in the context of its introduction in European diets (taking into account the cultural aspects of diets and national dietary advice in the EU);

- fill knowledge gaps on the health impact of alternative proteins and overall dietary shift in the European Union, in particular for those sources of proteins for which limited information on health impacts is available, such as (but not limited to) invertebrates or insects-based proteins (e.g. allergies, compliance with nutrient-based and food-based dietary guidelines and recommended dietary patterns), while considering gender aspects, and other safety aspects (e.g. not cytotoxic, no toxic aggregates or excessive amount of toxic substances);

- conduct a comparative systemic analysis of conventional and alternative proteins. New Product Environmental Footprint (PEF)-based categories should be created and health effects should be included in diet assessment frameworks. Non-linear effects should be studied, with regard to both consumption and production;

- highlight the need for new future-proof technologies and anticipate potential issues in relation to resource availability, pollution and societal acceptability;

- create or contribute to a data space to gather knowledge, information and results of studies, and share them openly (open science) among research communities, interested parties and the public (dietary data hub). Seek interactions and complementarities with the data space for R&I and the European Open Science Cloud, and contribute to increasing the level of FAIRness (Findability, Accessibility, Interoperability and Re-usability) of dietary data;

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61 World Economic Forum, Oxford Martin School, Oxford University (2019), *Meat: The future of series – Alternative proteins*.

- clearly explain how they will contribute to the farm to fork objectives and deliver co-benefits on each of the Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowering communities (e.g. meeting the needs, values and expectations of society in a responsible and ethical way); and

- implement the multi-actor approach by involving a wide range of food system actors and conducting inter-disciplinary research. Proposals should also promote international cooperation. Where relevant, activities should build and expand on the results of past and ongoing research projects (especially the four projects funded under topic *LC-SFS-17-2019: Alternative proteins for food and feed*). Projects should have a clear plan as to how they will collaborate with other projects selected under this topic (if funding of more than one project is possible) and topic *HORIZON-CL6-2021-FARM2FORK-01-02: Developing sustainable and competitive land-based protein crop systems and value chains*. They should participate in joint activities, workshops, focus groups or social labs, and common communication and dissemination activities, and show potential for upscaling. Applicants should plan the necessary budget to cover these activities. The possible participation of the JRC in the projects will also ensure that the proposed approach will be compatible with and/or improve existing databases and tools used at the European Commission with regard to the environmental aspects, and ensure open access to data.

- This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-13: Evidence-based decision-making to change social norms towards zero food waste

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 6.00 and 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 4-5 (according to the activity) by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environmentally friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposal will support R&I to prevent and reduce food loss and waste, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and

adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and the empowerment of communities.

Projects results are expected to contribute to all the following outcomes:

- More timely and responsive decision-making on food waste prevention and reduction by any actor seeking to implement a food waste prevention or reduction initiative, based on new, comprehensive and easily accessible evidence of the impact and cost-effectiveness of different measures and behaviours at different levels and across different sectors, including consumers;
- Food companies engage more and more effectively in food waste prevention and reduction activities.

Scope: Food loss and waste has negative impacts on society, the environment and the economy: it contributes to food insecurity and hinders nutrition; generates greenhouse gas emissions and creates pressure on land and water, including deforestation, degradation of natural habitats and biodiversity loss; it is also responsible for great economic losses. Such negative impacts are exacerbated in times of crisis (e.g. COVID-19), when food supply-chain disruptions generate additional food losses and wastes.

Reducing the amount of food intended for human consumption that is eventually lost or wasted represents a complex challenge, as it involves changing established business practices and people's habits, while guaranteeing the safety of food. As demonstrated by UNEP Food Waste Index Report 2021[62] , food is wasted mainly towards the end of the supply chain (particularly at consumption level, in households and food services). Here, consumer behaviour and the lack of awareness and coordination between actors in the supply chain play a key role. An additional issue directly linked with loss and waste is the amount of packaging that is eventually discarded with – or without – the food.

Successful proposals are expected to address two complementary areas:

Area A:

Developing a comprehensive evidence-based analysis of food loss and waste prevention actions, with the overall aim of informing decision-making. In particular, this should involve an impact assessment and cost-benefit analysis of existing food waste prevention actions in the EU and its associated countries, and of their economic, environmental and social impacts. This should include developing a database of actions and tools for preventing and reducing food waste and loss, which will help inform future interventions by different stakeholders and promote replicability across countries.

The development of sector-specific guidance sharing the key success factors, barriers and data for an effective prevention and reduction of food losses and waste is also recommended.

Area B:

Supporting research (i.e. development of an evidence base) and innovation (with a special focus on open and social innovation) on existing social norms responsible for food waste, so as to foster appropriate changes in consumer behaviour and business practices (e.g. marketing standards, retail and trade practices, restaurant portion sizes).

62 https://www.unep.org/resources/report/unep-food-waste-index-report-2021

This will involve gathering new evidence on the feasibility of innovations that are tailored to specific contexts.

On consumer behaviour, the investigation should include analysis of current trends and correlations as regards:

- Food waste and convenience food (i.e. ready to eat);
- Food waste at household level and food services (i.e. eating out/take away);
- Food waste, obesity and malnutrition;
- Food waste and crisis response policies (e.g. case of COVID-19).

As regards food businesses, this activity should support innovative and/or improved business practices in large companies and SMEs that:

- Effectively signal the value of food, so as to reduce food waste;
- Redesign portion sizes to reduce food waste;
- Operationalize food waste reduction and prevention though internal corporate policies and business strategies with supply chain actors.

The expected behavioural change should also be supported by new or specifically adapted technologies in both of the following areas: date marking and sustainable and smart food packaging.

Successful proposals should build on the work of the Commission's Joint Research Centre in support of the EU Platform on Food Losses and Food Waste, and be in line with the Commission's environmental footprint method[63], [64], especially as regards to the life-cycle assessment.

Successful proposals should deliver on food waste reduction and prevention across the food system. They should explain how they will deliver co-benefits to the Food 2030 priorities (nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, and innovation and empowerment of communities).

The required multi-actor approach (see eligibility conditions) will be implemented by conducting inter- and trans-disciplinary research and involving a wide range of food system actors, with special attention to consumers and civil society organisations.

Proposals should develop compelling communication products, potentially two-way communication activities for each relevant food system actor and an innovative science education package for schools. They are encouraged to build on past or ongoing EU-funded research and collaborate with relevant initiatives, including the Commission's Platform for Food Losses and Waste. They should set out a clear plan on how they will cluster with other proposals selected under this and any other relevant topic, e.g. by participating in joint activities, workshops, and common communication and dissemination activities.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

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63 JRC - Assessment of food waste prevention actions. Development of an evaluation framework to assess the performance of food waste prevention actions

64 Calculator for impacts of food waste prevention actions

Proposals should address inequalities, be they due to gender, race or other social categories. This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-14: Microbes for healthy and sustainable food and diets

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part. International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding.

Expected Outcome: The successful proposal will be in line with the European Green Deal priorities and the farm to fork strategy for a fair healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050. It will support R&I to foster advances in research related to microorganisms for safer, healthier and more environmentally friendly food processing. This is along with contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following expected outcomes:

- A furthering of open access provision for the necessary standardisation, identification, and mapping techniques of existing and potential beneficial microorganisms, and microbial consortia for use in food processing, which providing an assessment of their benefits with respect to nutrition, health, food safety, circularity, and sustainability.
- Knowledge from the assessment of the economic, societal and environmental importance of fermented foods and of their role in transition from animal to vegetable proteins.
- Advanced knowledge on what can be considered a healthy human microbiota and the conditions (for example diet and treatments) under which this equilibrium is disrupted.
- Further knowledge on fermentation-based solutions for food products and processes, such as improved nutritional, structural, and functional properties, and enhanced food preservation.

Scope: There is evidence that beneficial bacteria and other microorganisms can lead to a healthy animal and human gut microbiome, that microbiomes can improve food quality and safety (incl. tailored food) as well as the nutritional value of aliments/food, contributing to more sustainable food systems. The rupture of the human microbiome symbiotic relationship could also be associated to more health disorders and the cause of chronic diseases, and that food is an essential lever to maintain symbiosis by promoting optimal intestinal microbial diversity and restoring healthy microbiome profiles and functionality. An expected outcome of this topic is the further scientific underpinning, verification and elucidation of these investigative pathways through evidence driven research and innovation.

In this context food based on microbial fermentation needs further investigation as it currently accounts for 5 to 40% of our diet (country depending) yet we still know little of its role in the human digestive system after ingestion. Further research should provide sustainable dietary strategies based on microbe-fermented foods aiming to improve human health and sustainability of dietary patterns, and help in determining any possible role in metabolic disease control. Food fermented by microorganisms and food ingredients produced by them also have huge innovation potential, in particular for SMEs, for local development, and as a way of minimizing food waste from non-optimal raw material, waste products from food manufacturing, or seasonal overproduction.

Activities should develop applicable solutions, in particular for the food processing industry, and in the utilisation of fermentation potential. New products may seek EU market regulatory approval, thus proposals should consider and address relevant regulatory requirements as well as EFSA guidance documents for specific safety testing and risk assessment protocols.

Proposals are expected to address the following:

- Understand the interaction of microbial biodiversity, mechanisms between fermented foods, different types of food microbiomes, and the human microbiomes in order to determine the role of fermented food in nutrition, health and diet diversification.

- Develop applicable solutions for the food processing industry utilizing microbial potential in the production of food ingredients, and nutrients including formulation into food products.

- Develop new tests to evaluate the condition of the symbiosis between humans and microbiotas used routinely in pro- and diagnostics.

- Using microbes to reduce food packaging, food processing inputs (e.g.: energy, water), chemicals used in food (production), while ensuring the increased lifespan and safety of the products and the benefits to human and animal health.

- Activate societal engagement with relevant stakeholders (e.g. farmers, civil society organisations, regulatory bodies, citizens and media outlets) in order to ensure product acceptability and labelling in compliance with the relevant legal framework.

Proposals should explain how they will deliver co-benefits to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities as well as those relevant to different socio-economic and cultural groups.

Proposals must implement the multi-actor approach by involving a wide diversity of food system actors and conducting inter- and trans-disciplinary research engaging consumers, consumer organizations and civil society organisations and including local and indigenous knowledge of soils.

Proposals are encouraged to build on past or ongoing EU-funded research, research infrastructures and collaborate with relevant initiatives, including the Horizon Europe Soil Health and Food Mission. International cooperation (such as the International Bioeconomy Forum) is highly recommended. Proposals should include a clear plan on how they will collaborate with other proposals selected under this and any other relevant topic, by participating in joint activities, workshops, as well as common communication and dissemination activities. Proposals should plan the necessary budget to cover these activities.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-15: Transition to healthy and sustainable dietary behaviour

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environment-friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposal will support R&I to facilitate the transition towards healthy and sustainable dietary behaviour. It will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

The main objective of this topic is to understand better, and measure, factors influencing dietary behaviour. It also seeks to support the development of innovative, effective tools and strategies to facilitate the transition towards healthy and sustainable dietary behaviour and self-management of dietary habits.

Project results are expected to contribute to all of the following outcomes:

- improved knowledge and understanding of the factors influencing the dietary behaviour of different target groups (in particular vulnerable groups) across Europe, including barriers and constraints;

- identification of effective means whereby each food system actor can foster behavioural change;

- enabling consumers to make informed food choices;
- a scientific basis for dietary advice to support policymakers and Member States that will empower individuals to adopt healthy and sustainable dietary behaviours, choices and lifestyles, as a win-win for their health and the environment, building on the advice of competent bodies at national, EU and international levels; and
- a better scientific basis on which policymakers could develop communication strategies that would increase the acceptability of food and health policy interventions by all actors and sectors that aim to support a shift towards healthy and sustainable diets for all, bearing in mind that education and dietary advice is a national competence.

Scope: Changes in food production, processing and consumption patterns have contributed to diet-related health problems worldwide[65]. Non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs), cancer, obesity, chronic respiratory diseases and diabetes account for 71% of all deaths. NCDs are largely preventable through effective interventions that tackle shared risk factors such as unhealthy diet, physical inactivity, tobacco use and the abuse of alcohol. According to the EAT-Lancet Commission, a shift from current diets to healthier diets is likely to benefit human health substantially, averting about 11 million deaths per year. Long-lasting, healthy and sustainable dietary behaviour needs to be given high priority from an early age, as good eating habits are usually formed in childhood.

The change of dietary behaviour is a complex challenge subject to manifold influences that should be better understood at individual and system levels, and through public engagement and inter-/trans-disciplinary approaches. The development of new approaches/strategies/tools requires a systemic approach involving all the main actors at different levels, who can ensure acceptance of and better adherence to healthy and sustainable dietary behaviour. These include governmental and public authorities, healthcare providers, education systems from schools to universities, (local) producers, the food industry, retailers, hospitality and food services, non-governmental consumer and patient organisations, the general public, policymakers and the media.

Proposals should consider a range of geographical, socio-economic, behavioural and cultural factors and aim to produce innovative and effective strategies, tools and/or programmes promoting sustainable and healthy dietary behaviours and lifestyles to be used by policymakers, and monitoring approaches for measuring progress towards these goals if policymakers decide to implement such strategies, tools and/or programmes. The gender dimension (possible physical and behavioural differences) should also be investigated. Data collected and integrated by the private and public sectors should be broken down by gender and age.

Where relevant, activities should build and expand on the results of past and ongoing research projects, and input from national, EU and international competent bodies. Selected projects under this topic (and under the topic HORIZON-HLTH-2022-STAYHLTH-01-05-two-stage: *Prevention of obesity throughout the life course)* are strongly encouraged to participate in joint activities as appropriate, possibly in the form of project clustering, workshops, etc. Proposals are expected to demonstrate support for common coordination and dissemination activities. Applicants should plan the necessary budget to cover such activities.

Proposals are expected to address the following:

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[65] Scientific Advice Mechanism, Group of Chief Scientific Advisors: Towards an EU Sustainable Food System, Scientific Opinion n°8 (March 2020).

- map and monitor dietary patterns at national/regional/rural/(sub)urban levels relevant to different genders, socio-economic and cultural groups, including the most vulnerable, to provide a snapshot of the situation across Europe;

- identify, involve and analyse different population groups, in particular the most vulnerable, and the health and environment impact of their choices, in order potentially to enable them to benefit from the outcome of the project;

- understand and measure the impacts of the factors and incentives influencing individual and collective dietary choice and behaviour across Europe;

- improve our understanding of the barriers and enabling factors affecting food system actors' efforts to improve food environments and to produce, process, promote and provide healthier and environmentally, socially and economically sustainable food products/processes/services to respond to citizens' needs/demands;

- for specific groups, develop innovative actions/approaches/interventions for different countries, region, urban and rural areas that policymakers could use to facilitate the transition towards healthy and sustainable dietary behaviour and lifestyle, and evaluate the effective impact if those would be implemented;

- develop innovative and effective tools to improve education, communication, engagement and training on sustainable healthy nutrition and diets, and on sustainable food systems, adapted to different population groups in respect of cultures, needs and gender at different levels (e.g. public authorities, health care providers, education systems). The tools should be available to the responsible national authorities, to support their efforts on health promotion, disease prevention and care;

- develop science-based tools for translating the scientific evidence base into easy-to-understand food-based dietary guidelines by national competent authorities that take account of local, seasonal, cultural, social, ethical, health and environmental factors and help consumers to make informed, responsible and easy choices;

- fill knowledge gaps and update the scientific evidence base to provide support for national authorities developing dietary guidelines for specific population groups (using the basis provided by national, EU and international competent bodies);

- provide recommendations for policymakers, underpinned by scientific evidence, to facilitate the transition towards healthy personalised management and sustainable dietary behaviour and lifestyle; and

- provide evidence-based cost-benefit analysis of the proposed measure(s).

The multi-actor approach (see eligibility conditions) will be implemented by involving a wide range of food system actors and conducting inter-/trans-disciplinary research. Proposals should bring together multiple types of scientific expertise in health and natural sciences, and social sciences and humanities. This topic should involve the effective contribution of SSH disciplines.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-FARM2FORK-01-16: Identification, assessment and management of existing and emerging food safety issues

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environment-friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposal will support R&I on integrated approaches throughout the food system for detecting, assessing and mitigating relevant food safety risks. It will contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following outcomes:

- reduced risks from biological and chemical hazards throughout the food system;
- administrations' ability to anticipate and mitigate emerging food safety risks, capacity and expertise for risk assessment activities including holistic risk assessment (risks in combination with benefits) and best-fitting control measures for biological and chemical hazards across the food system;
- improved support for food systems regulatory science (integrated risk-benefit assessment, cost-benefit assessment) through robust holistic risk assessment;
- improved use of 'big data' to predict and prevent emerging food related threats; and
- long-term anticipation and prevention of emerging risks for food and feed safety, plant, soil and animal health, and nutritional quality through better trend tracking and characterisation systems.

Scope: Food-borne diseases are a significant cause of morbidity and mortality, and a significant impediment to socio-economic development worldwide, but the full extent and burden of unsafe

food, and especially the burden arising from chemical and biological hazards, is still largely unknown[66].

Successful proposals are expected to address both of the following areas (area A and area B):

Area A

- develop methods for early identification and monitoring of drivers of (re)emerging food safety risk and threats (e.g. global environmental changes, globalisation, technological innovations, policy changes, changes in values, perceptions and sensitivity, change in economic models, etc.);
- develop methods and devices for the characterisation of emerging risks, with the aim of anticipating and possibly mitigating/preventing impacts (preparedness);
- develop educational material/curricula to help strengthen existing food safety risk analysis teaching with an inter-/trans-disciplinary systems dimension;
- engage authorities and the general public throughout Europe in early warning and the identification of emerging risks through a coordinated citizen science approach, and food safety awareness-raising efforts;
- develop guidance on how to integrate food safety considerations in the design phase of innovations such as circular economy, by identifying possible emerging risks, in liaison with relevant initiatives that would benefit from the results;
- develop methods to guarantee food safety in local food systems from farm to fork, in particular in small-scale businesses, and local cooperatives; and
- develop holistic risk-benefit assessment methods and tools, and adapt these for use in a regulatory setting.

Area B

- improve knowledge on the persistence of pathogens (including viruses) in food matrices and food processing environments for improved microbe control;
- develop data, indicators and tools to address and tackle the risks associated with new and food-borne pathogens (including viruses);
- develop and validate detection methods for new hazards and develop methods and devices for early identification of risks for food safety and threats;
- develop more robust and responsive models for food safety crisis management, taking into account socio-economic and environmental factors;
- analyse drivers of risks (globalisation, urbanisation, environmental degradation, climate change, etc.) to support the long-term anticipation and possible prevention of emerging risks; and

[66] WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015. http://who.int/iris/bitstream/handle/10665/199350/9789241565165_eng.pdf

- develop scientific evidence to support assessment of the risk posed to susceptible human subpopulations (including gender in the research context) and ecosystems and the underlying risk drivers.

Successful proposals should deliver support for evidence-based policymaking and related risk assessment activities and implementation needs, in particular for the development of effective regulatory control and enforcement aspects in the area food safety. Engagement with risk managers and risk assessors is expected for priority-setting and to deliver impactful results.

Proposals should explain how they will deliver co-benefits to the four Food 2030 priorities.

The multi-actor approach (see the eligibility conditions) must be implemented by involving a wide range of food system actors and conducting inter-disciplinary research. Proposals are encouraged to follow the One Health[67] approach and to build on past or ongoing EU-funded research and cooperation with relevant initiatives (such as the One Health' European joint programme[68]). They should have a clear plan on how they will collaborate with other projects selected under this topic (if funding of more than one project is possible). They should participate in joint activities, workshops and common communication and dissemination activities. Applicants should plan the necessary budget to cover these activities.

HORIZON-CL6-2021-FARM2FORK-01-17: Increasing the transparency of EU food systems to boost health, sustainability and safety of products, processes and diets

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 11.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 11.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 (according to the activity) by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 300 000 in

67 https://www.who.int/news-room/q-a-detail/one-health

68 One Health European Joint Programme: https://onehealthejp.eu/

	order to cover the expenses for developing and piloting crosscutting and systemic solutions that improve transparency with regards to one or several of the six objectives mentioned in the topic.

Expected Outcome: In line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environment-friendly food system, the successful proposal will support R&I to increase transparency across food systems to boost health, sustainability and safety of products, processes and diets, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Advances in R&I to upgrade transparency will provide multiple benefits relevant to improving food safety, fighting food fraud and addressing growing public concern in the EU as regards the climate, biodiversity and environmental impacts of food and diets in practice.

Projects results are expected to contribute to all following expected outcomes:

- accelerate the deployment of transparency innovations and solutions in EU food systems, especially among micro-enterprises and SMEs, to boost health, sustainability, and safety of products, processes and diets, and drive climate action; and

- ensure that future transparency innovations and solutions are demand-driven, systemic and cost-effective, and support the objectives of the EU farm to fork strategy and the EU Green Deal.

Scope: Despite technological progress and the emergence of new approaches, solutions and methodologies, recent literature[69] highlights continuing challenges in increasing the uptake of transparency solutions among food system actors. These include concerns about connectivity, interoperability, privacy, cost-efficiency and low consumer confidence in the technologies being deployed. In addition, many point to the fragmentation and complexity of food systems, the high number of SMEs and micro-companies, and the cross-cutting and systemic nature of transparency innovations as important reasons for the slow deployment of the solutions.

Transparency (defined in supply chains as access to non-distorted, factual, relevant and timely information about supply chain products[70]) is a critical component of modern food systems. Transparency of food production from farm to fork is crucial to inform consumers, authorities and food system actors on product characteristics such as origin, production method, ingredients and safety, and on sustainability and ethical aspects of products and processes. It is also a crucial factor in ensuring food traceability and authenticity.

Proposals should accelerate the deployment of transparency solutions in EU food systems, especially among micro-enterprises and SMEs, to boost health, sustainability and safety of products, processes and diets in the period to 2030, and drive climate action. In particular, proposals should facilitate innovations that increase transparency in support of six objectives:

1. Improving the efficiency and effectiveness of traceability;

2. Making it easier for people to adopt healthy and sustainable diets with a lower environmental and climate impact, by advancing innovations that provide and process transparency data across

69 E.g. https://doi.org/10.1016/j.tifs.2019.07.024
70 https://doi.org/10.1016/j.aei.2010.06.001

the food chain to support the implementation of the future EU framework for sustainability labelling;

3. Making it easier for farmers and food businesses to increase the sustainability of their products and processes, and make them more nutrition-sensitive;

4. Drastically improving the efficiency and effectiveness of food safety processes and procedures, within companies and beyond;

5. Increasing the authenticity of products, and reducing food fraud; and

6. Increasing the capacity of authorities and policymakers that deal with food safety, sustainability, nutrition and health to monitor the performance of different parts and processes of the food system.

Proposals should build a network of expertise that can act as an EU hub for knowledge sharing and the demonstration and piloting of systemic solutions relating to transparency. The network should be governed by a wide range of experts and stakeholders, including primary producers, processors, retailers, food service providers, consumers, public and private institutions (governmental institutions, civil society, including NGOs, and industry), investors, entrepreneurs and policymakers.

Proposals should create an inventory of validated technologies (such as IoT, blockchain, artificial intelligence, 5G/edge, and 'big data'), open data, approaches and methodologies based on past research and emerging best practice. They should demonstrate the use of these technologies to address the above objectives using existing or emerging data infrastructures across the food chain. They should make a particular effort to valorise relevant past EU-funded research.

Proposals should consolidate the state of play as regards approaches for dealing effectively with cross-cutting challenges (e.g. connectivity, privacy, interoperability, consumer acceptance, cost-effectiveness, skills) and address the lack of such approaches where needed and in line with the relevant legal frameworks.

Proposals should widely disseminate and communicate expertise among primary producers, processors, retailers, food service providers, public and private institutions (governmental institutions, NGOs, industry), investors, entrepreneurs and policymakers. In this way, they should build awareness, education and skills on at European level in a way that supports solution development in practice in major food categories, by taking into account EU, national, regional and sectoral contexts and needs (health, food & nutrition policies, environmental, socioeconomic, cultural, gender-related, behavioural and dietary).

Proposals should develop methodologies, tools and approaches to enable the clients of the network of expertise to engage actively with end-users of transparency solutions (e.g. retailers, public authorities), a broad range of food system actors, technology and infrastructure providers and policymakers, to make sure that new transparency solutions are demand-driven, systemic, in line with the relevant legal frameworks, and cost-effective, and that they support the objectives of the EU farm to fork strategy, including the implementation of the future food sustainability labelling framework. Proposals are encouraged to assess the merits of existing and future citizen-science initiatives that can help build or uptake transparency solutions.

Proposals should help clients to apply systems thinking to identify challenges linked to the above objectives and possible innovative systemic solutions. They should help them understand and assess how transparency solutions will be used and how they will generate benefits and incentives for

consumers and food businesses by enabling policy development (including the implementation of a future EU framework for sustainability labelling). They should stimulate mutual learning across parts of food systems, scientific disciplines, geographies and languages.

Proposals should perform these tasks using a business model that guarantees the functioning of the network and its services beyond the lifespan of the project.

In addition, proposals should develop and pilot cross-cutting and systemic solutions that improve transparency as regards one or more of the six objectives, while respecting the relevant legal frameworks and national competence in the area of diet and health, to complement and support the above tasks. The pilots should advance solutions that can benefit a wide range of micro-enterprises and SMEs. For the purpose of the pilots, proposals may involve financial support for third parties in the form of grants, typically in the order of EUR 100 000 to 300 000 per party. These amounts are deemed sufficient to ensure that solutions are demand-driven, systemic and cost-effective, and support the objectives of the EU farm to fork strategy and the EU Green Deal. Up to 20% of the EU funding requested by the proposal may be allocated to the purpose of financial support for third parties.

Proposals should explain and map how the pilots will achieve co-benefits relevant to the Food 2030 priorities (nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities).

Proposals should set out a clear plan on how they will collaborate with other projects selected under this and any other relevant topic, by participating in joint activities, and common communication and dissemination activities. Proposals are encouraged to link with relevant smart specialization platforms.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-FARM2FORK-01-18: One Health approach for Food Nutrition Security and Sustainable Agriculture (FNSSA)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, consortia must include at least five independent legal entities established in Africa. The places of establishment of at least four of these legal entities must be in the same geographical region of Africa

	(as defined by the African Union: https://au.int/en/member_states/countryprofiles2) Due to the scope of this topic, legal entities established in all member states of the African Union are exceptionally eligible for Union funding. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part. International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: The EU's relationship with Africa is a key priority for the EU. The effects of the COVID-19 pandemic and the growing urgency of the climate crisis put pressure on both domestic/local food production and on ecosystems that generate higher health risks for plants, animals and humans with the emergence of new pest and diseases.

In line with the farm to fork strategy, and the development of Green Alliances on sustainable food systems, successful proposals will provide a comprehensive and integrated response to current and future challenges benefiting people, nature and economic growth in Europe and in Africa.

Projects results are expected to contribute to all of following expected outcomes:

- EU – Africa jointly tackle climate change and environment-related challenges and meet the objectives of the Paris Agreement on climate change, and contribute to the Sustainable Development Goals;
- develop nature-based solutions to plant nutrition, plant health and animal health addressing human health, with innovative methods and technologies that optimize, and limit when necessary, the use of external inputs and helps farmers in the implementation of regulated deficit strategies;
- strengthened transdisciplinary research and integrated scientific support for relevant EU policies and priorities (the EU strategy for Africa, European Green Deal objectives, etc.);
- In line with the EU priorities, proposals should take into consideration the objectives of the European One Health Plan against Antimicrobial Resistance (AMR) [71]that aim at making the EU a best practice region, boosting research, development and innovation and shaping the global agenda.

Scope: The "One Health" approach to plant and animal health is based on a systemic perspective linking the health of ecosystems, animals and humans. It requires interventions at different level (local, territorial, value chain) and coherent public policies. 'One Health' can be applied to establish a

[71] The European One Health Plan Against Antimicrobial Resistance (AMR) can be found at: https://ec.europa.eu/health/sites/health/files/antimicrobial_resistance/docs/amr_2017_action-plan.pdf

transformative approach to increasing sustainable practices in agriculture and improving the overall health and well-being of humans, animals, and natural ecosystems.

There is a need to fill knowledge gap regarding interactions with different components and especially between human and animal and plant health and strengthen monitoring and evaluation systems to prevent the emergence and spread of pest and diseases with nature-based solutions.

Proposals should build on existing and new knowledge, data, models (including in situ calibration measurement) and available tools to:

- identify local farm animals and crops in the different agro-ecological zones in Africa to maintain/increase productivity, resilience and nutritional quality taking into account the interactions between plants, animals, diseases, pests, zoonosis and ecosystems under conditions of limited external inputs and increased abiotic and biotic stresses;

- develop innovative means including innovative methodologies for risk assessments and practices to tackle current and emerging plant pests and diseases, pests and zoonosis (including transboundary infectious livestock diseases) taking into account the interactions between plants, livestock health and the natural ecosystems;

- develop sustainable and systemic integrated approaches to plant and animal health from farm to international scales in line with a greener agriculture by optimising resource efficiency, minimising production losses and avoiding geographical spread of diseases/pathogens (i.e. control of locusts or other migratory pests, development of vaccines) including animal breeding and being responsible/respectful of natural ecosystem integrity, goods and services;

- establish a multidisciplinary team that works together to achieve these outcomes and bring together experts from academic, government, public, and private institutions to achieve meaningful change in public awareness, policies, and practices that support implementation of sustainable agricultural practices.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector and, as relevant, bio-based industry active in rural areas.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-FARM2FORK-01-19: EU-China international cooperation on integrated pest management in agriculture

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Research and Innovation Actions

Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Procedure	The procedure is described in General Annex F. The following exceptions apply: Grants awarded under this topic will be coordinated with the Ministry of Science and Technology, China (MOST).
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Grants awarded under this topic will be linked to the specific grants awarded by the Ministry of Science and Technology, China (MOST) to the Chinese partners. The respective options of the Model Grant Agreement will be applied.

Expected Outcome: In line with the farm to fork strategy, the successful proposals will help to promote a global transition to sustainable food systems. They will therefore help to ensure sustainability of agri-food systems, catering for the needs of a growing population and support the development and implementation of integrated pest management practices. They will strengthen international cooperation with actors from China in the areas of integrated pest management.

Project results are expected to contribute to all the following expected outcomes:

- reduce the use of pesticides for crops of importance to the EU, Associated Countries and China which dependency on chemical pest management is currently high;
- increase on-farm use and implementation of integrated pest management practices;
- develop integrated pest management training for farmers/growers and extend the range of applications through incentives to increase the uptake of integrated pest management practices;
- raise awareness of integrated pest management practices and improve product quality and food safety by decreased residue concentrations of pesticides in crops and lower environmental impact.

Scope: A high percentage of food crops is lost to plant pests and diseases annually. At the same time, concerns are mounting over the impact of pesticides used in agriculture on the environment, non-target organisms and human health. Proposals should support the development and implementation of integrated pest management practices for crops where the dependency on conventional chemical pesticides is the highest, and where the exchange of information, best practices and technologies is of benefit to the EU, Associated Countries and China.

Proposals should:

- enlarge the range of tools available for integrated pest management practices, such as crop diversification leading to more functional diversity, effective cropping techniques, appropriate

species and varieties resistant to pests, the development of biological control agents, the preservation and enhancement of natural enemies of pests etc.;

- develop technologies enabling the prevention, modelling and monitoring of pest emergence allowing timely and appropriate intervention in line with the principles of integrated pest management;
- develop risk assessment methods for assessing the risks and environmental impacts of these technologies;
- support capacity building, training and education enabling farmers/growers to adopt sustainable agricultural practices in pest management and the establishment of a reward/incentives system.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector. Practical solutions for farmers/growers, close to the market, should be facilitated by the involvement of industry, including SMEs, to promote the transfer of technology relating to integrated pest management.

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China. This topic is envisaged to be implemented as a coordinated call but if no agreement is reached with the Ministry of Science and Technology China (MOST) on the co-funding of Chinese partners, it will be implemented as a normal call. Updates will be published on the Funding & Tenders Portal.

Destination 3 – Circular economy and bioeconomy sectors

HORIZON-CL6-2021-CIRCBIO-01-01: Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 21.50 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply:

	Proposals funded under this topic, and their circular systemic solutions, must form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI). This means that: • Proposals have to achieve deep cooperation between them by means of specific activities which will be included in at least one of their work-packages; • Proposals have to cooperate with CCRI and its coordination service by means of sharing with this initiative knowledge and experiences developed during the implementation and demonstration of the circular systemic solutions; • Proposals have to participate in the CCRI's events. Applicants have to acknowledge and integrate these obligations into their proposal.
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will support the delivery of solutions to implement the European Green Deal, the circular economy action plan and the bioeconomy strategy. The topic will support the transition towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale across regions of Europe.

Proposals funded under this topic will form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI)[72]. Proposals are expected to provide policy-makers, public and private investors and local communities with concrete and demonstrated examples of circular systemic solutions. In the context of this topic, a circular systemic solution is defined as a demonstration project for deploying a circular and climate-neutral economy at urban and/or regional scale, involving key stakeholders and, ideally, addressing more than one economic sector.

Projects results are expected to contribute to all the following expected outcomes:

- Improved circularity and reduced GHG emissions in economic sectors, natural ecosystems, and efficient valorisation of local resources in cities, regions or their groupings.
- Creation of business opportunities in the circular economy at urban and/or regional scale.
- Increased circular and climate-neutral practices among citizens and their participation in circular systemic solutions.
- Enhanced knowledge transfer between the cities, regions or their groupings involved in the proposals financed under this topic and other cities and regions in EU Member States and Associated Countries.

[72] https://ec.europa.eu/research/environment/index.cfm?pg=circular

- Creation of jobs in the short to medium-term perspective.

- More effective widespread uptake and easier replication, scalability and visibility of circular systemic solutions and hence multiplication of their economic, social and environmental benefits to achieve the policy targets of the European Green Deal, circular economy action plan, EU bioeconomy strategy and the European industrial strategy at local, regional, national, European and international levels.

Scope: Proposals are expected to implement and demonstrate circular systemic solutions for the deployment of the circular economy (including the circular bioeconomy) in cities, regions or their groupings.

The implemented circular systemic solutions should address economic, social and environmental dimensions of the transition towards a circular economy and include science, technology and governance components. They should demonstrate circular governance models and support the active participation of all relevant actors in cities, regions or their groupings. Examples of relevant actors are: public administrations and utilities; private sector services and industries, including small and medium enterprises (SMEs); scientific and innovator communities including incubators and accelerators; financial intermediaries with a focus on environmental and social impact; venture capitalists and business angels; civil society, including citizens; and non-governmental organisations and philanthropy.

The implemented circular systemic solutions may consider applying the circular economy principle not only to waste and water management, but also to other sectors including, for example, one or more of the new circular economy action plan key product value chains, i.e.: batteries and vehicles, electronics and ICT, packaging, plastics, textiles, construction and buildings, food, water and nutrients.[73] The circular systemic solutions may also include nature-based solutions. Circular systemic solutions and the economic sectors involved in them should be selected and based on a detailed analysis of the cities, regions or their groupings' socio-economic and environmental needs to be addressed, circular potential to be exploited and challenges to be tackled.

Circular systemic solutions should identify, analyse and, when feasible, quantify the economic, social and environmental benefits and trade-offs/challenges related to their implementation and demonstration. They should include the monitoring and evaluation of the transition towards a circular economy, identify their strengths and weaknesses as well as causes. They should analyse the experimented regulatory obstacles and drivers and provide clear and precise policy recommendations to improve circular economy. Each circular systemic solution should address environmental externalities and contribute to preserving and, where possible, increasing the well-being and the health conditions of the local communities involved in the transition towards a circular economy.

It is crucial that the circular systemic solutions implemented and their business models have a high replicability and scalability potential. This is fundamental to facilitate that circular systemic solutions demonstrated in specific areas will be replicated in others. During their implementation and by the end of their life cycle, the selected proposals are expected to share with all stakeholders clear and comprehensive guidelines on the circular systemic solutions adopted, including their strengths and weaknesses experienced.

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73 https://ec.europa.eu/environment/circular-economy/

It is essential that proposals also ensure complementarity and cooperation with existing and future relevant European projects on the circular economy and the circular bioeconomy, with special reference to those on local and regional scale, and avoid overlaps and repetition. In particular, cooperation and complementarity should be ensured with the projects under the European Green Deal Call's topic 'LC-GD-3-2-2020 - Demonstration of systemic solutions for the territorial deployment of the circular economy'.[74]

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-CIRCBIO-01-02: Circular Cities and Regions Initiative's project development assistance (CCRI-PDA)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 0.40 and 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Proposals funded under this topic must form part of the instruments for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI). This means that: • Proposals have to cooperate with CCRI and its coordination service by means of sharing with this initiative knowledge and experiences gained through the implementation of the CCRI-PDA service; • Proposals have to participate in the CCRI's events. Applicants have to acknowledge and integrate these obligations into their proposal.

Expected Outcome: The successful proposal will support the delivery of services and solutions to implement the European Green Deal, the circular economy action plan, the bioeconomy strategy.

[74] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-3-2-2020;freeTextSearchKeyword=green%20deal;typeCodes=1;statusCodes=31094501,31094502,31094503;programCode=H2020;programDivisionCode=null;focusAreaCode=31087050;crossCuttingPriorityCode=null;callCode=H2020-LC-GD-2020;sortQuery=submissionStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState

The topic will support the transition towards a sustainable, regenerative, inclusive and just circular economy across regions of Europe at local and regional scale.

The Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA) will be included in the instruments implementing the European Commission's Circular Cities and Regions Initiative (CCRI).[75] It will be carried out in close coordination and cooperation with the CCRI.

Investors and lenders need to gain more confidence on investment projects related to circular economy which are still seen as risky. European added value can be achieved, for example, where projects introduce innovation to the market regarding financing solutions minimising transaction costs and engaging the private finance community. European added value could also be achieved where projects demonstrably address legal, administrative and other market opportunities and challenges for innovative and sustainable circular economy investment schemes.

Projects results are expected to contribute to all the following expected outcomes:

- Delivery of innovative financing schemes that are operational and ready to finance circular economy investments at local and regional scale;
- Delivery of a series of sustainable circular economy projects and innovative financing solutions/schemes at local and regional scale across Europe;
- Demonstration of innovative and replicable investment financing solutions, documenting feedback/uptake from potential replicators.

Scope: The CCRI-PDA services will be provided to public and private project promoters such as local and regional authorities or their groupings, public/private infrastructure operators and bodies, utilities and services, industry (including SMEs). The action will support building technical, economic and legal expertise needed for project development and leading to the launch of concrete investments.

The purpose of the CCRI-PDA is to help project promoters develop their projects and to bring together the technical, economic and legal expertise needed for developing circular economy investment projects at local and regional scale resulting in the actual launch of investments during the action. Ultimately, PDA projects should demonstrate the financial viability and sustainability of circular economy investment projects at local and regional scale and provide tangible showcases that should trigger further market replication.

The CCRI-PDA will pay for those activities necessary to prepare and mobilise finance for investment programmes, such as feasibility studies, stakeholder and community mobilisation, business plans and preparation for tendering procedures or setting up a specific financing scheme/financial engineering.

Proposals should address the development or replication and implementation of innovative financing schemes for circular economy investments at local and regional scale.

The CCRI-PDA services should support public and private project promoters to launch investments for activities aimed at increasing circularity in economic sectors that are relevant for the transition towards a sustainable circular economy at local and/or regional scale. The economic sectors involved

[75] The CCRI is part of the European circular economy action plan (CEAP) and aims to support circular solutions for the transitions towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale https://ec.europa.eu/research/environment/index.cfm?pg=circular

in each CCRI-PDA service should be selected according to local and/or regional circular economy needs, resources and potential. This selection must be clearly justified and explained.

Proposals should clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale. Ideally, the proposed investments should be launched before the end of the action, which means that projects should result in signed contracts for circular economy investments at local and regional scale to that effect.

In addition, proposals should include some of the following features:

- Clearly focus their activities on the launch of significant circular economy investment programmes at local and regional scale;
- An exemplary/showcase dimension in their ambition to increase circularity in specific sector(s) at local and regional scale and/or in the size of the expected investments and leverage factors[76];
- Deliver organisational innovation in the mobilisation of the investment programme (e.g. bundling, pooling or stakeholder engagement);

Moreover, all proposals should demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results towards potential replicators across EU Member States and Associated Countries.

Indicatively, the CCRI-PDA focuses on small and medium-sized circular economy investments of up to EUR 20 million.[77]

The EU contribution per proposal should not exceed 10% of the respective investment.

Proposals should justify the budget for the PDA provided to public and private project promoters based on the expected investment portfolio to be set up including the expected amount of investments to be triggered and the respective leverage factors to be achieved.

Proposals are expected to ensure synergies and complementarities with other EU financial schemes for circular economy projects. Examples and background information on already existing PDA facilities are available at: https://ec.europa.eu/easme/en/project-development-assistance-pda

HORIZON-CL6-2021-CIRCBIO-01-03: Innovative solutions to over-packaging and single-use plastics, and related microplastic pollution

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.

[76] i.e. the amount of circular economy investment triggered for each euro of Horizon Europe support.

[77] The Circular Economy Technical Assistance Facility (CETAF) will focus on projects and programmes with a minimum total investment volume of EUR 20 million.

Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all impacts in this destination related to consumers and industry, in particular to European industrial sustainability, competitiveness and resource independence by lowering the environmental footprint, enabling climate-neutrality and higher resource efficiency, through increased circularity and a resulting reduction in GHG and air pollution emissions.

Project results are expected to contribute to at least three of the following outcomes:

- Increased deployment and market uptake of innovative solutions, through better design, alternative materials, business models promoting reuse, deposit systems, smart labelling in support of and complying with the current relevant legal framework and, when scope would cover the food chain, the future EU framework for sustainability labelling, etc.
- Increased reuse, recyclability and upcycling of packaging and single-use plastics
- Significant reduction in over-packaging and single-use plastics in consumer goods, food packaging and humanitarian relief items
- Significant reduction in packaging waste and single-use plastic waste
- Significant reduction in management costs for the respective waste streams
- Significant reduction in the release of microplastics from packaging and single-use plastics into the environment

Scope: The amount of materials used for packaging is growing continuously and in 2017 packaging waste in Europe reached a record – 173 kg per inhabitant, the highest level ever. In order to ensure that all packaging on the EU market is reusable or recyclable in an economically viable way by 2030, the essential requirements for packaging relate to reducing (over)packaging and packaging waste, designing for re-usable and recyclable packaging, including alternative reusable products or systems, and reducing the complexity of packaging materials.

Plastics continue to be one of the key areas in the 2020 circular economy action plan (CEAP). This is due to their circularity potential, but also due to concerns about their environmental footprint and the use of primarily fossil-based feedstock for their production. One of the main sources of pollution is the amount of single-use plastics and plastics packaging that is wasted daily and that overburdens our waste and water management systems. A particular issue regarding plastics is the pollution from microplastics and disintegrating material, which reaches the soils and ocean and whose possible health impacts on animals and humans still need to be assessed in depth. Some of these microplastics are added intentionally to products such as cosmetics, while other pollution comes from the disintegration and migration of various types of plastics during their use and waste phases. Plastic waste is also an unintended consequence of humanitarian response – often funded by European taxpayer money – and leading to pollution in countries receiving aid but without the capacity to manage the waste.

In line with the EU strategy for plastics in a circular economy and the Single Use Plastics (SUP) Directive, and in line with the priorities on plastics and packaging in the CEAP, projects should combine at least three of the following elements: a reduction of (over)packaging and packaging waste, design for reuse and recyclability of packaging, a reduction of material complexity including the number of materials used (including diverse polymers), the restriction of intentionally added microplastics, increasing the uptake of alternatives decreasing the dependency on fossil fuels and the related pollution, and measures to prevent the release of microplastics at all relevant stages of the product life cycle.

Projects should demonstrate at large scale and validate innovative solutions that are quantitatively relevant and replicable under diverse economic, geographical and social conditions, and across sectors, including humanitarian response, through better design, alternative materials (including biobased and biodegradable), business models promoting reuse, recycling, upcycling, deposit systems, smart labelling, sensor-based sorting, etc. to tackle over-packaging and single-use plastics in consumer goods, food packaging and humanitarian relief items. Where the use of alternative materials is concerned, projects should address aspects to assure quality and safety of these new alternatives.

All solutions should be based on life-cycle approaches. Proposals should integrate life cycle assessment using the European Commission's Product Environmental Footprint (PEF) method and relevant costing methods. Projects should choose a systemic approach to value chains and end users, including consumers as key actors. All achieved outcomes should be demonstrated using quantitative indicators and targets wherever possible.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

Research on the above issues in the humanitarian context (relating to humanitarian relief items) is also eligible under this topic.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-CIRCBIO-01-04: Increasing the circularity in textiles, plastics and/or electronics value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 22.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all impacts in this destination related to consumers and industry, in particular to European industrial sustainability, competitiveness and resource independence by lowering the environmental footprint, enabling climate-neutrality and higher resource efficiency, through increased circularity and a resulting reduction in GHG and air pollution emissions.

Project results are expected to contribute to at least four of the following outcomes:

- Increased deployment and market uptake of new technological solutions to waste management and recycling, and the measurement of recycled content
- Enhanced diffusion and demonstrated benefits of advanced digital solutions in circular businesses
- Emergence of new value chains using upcycled, recycled and/or biobased resources
- Increased upcycling and recycling rates for the targeted material streams
- Increased uptake of recycled material and upcycling to new higher-value products
- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions
- Increased diffusion of new circular business practices, in particular in the uptake of repair, reuse and remanufacturing
- A significantly higher level of involvement of all actors (manufacturers, retailers, consumers, CSOs, public administration etc.) in circular practices
- Increased level of information and awareness of citizens regarding circular and climate-neutral products and services
- Strengthened competitiveness and job retention and creation potential of circular value chains under different economic and social conditions

Scope: The 2020 circular economy action plan (CEAP) highlights the four material streams textiles, plastics, electronics including ICT equipment, and construction as particularly important with regard to their circularity potential and their environmental footprint. The circularity deficits for these streams are mainly due to the: lack of trust in secondary raw materials; lack of control over supply chains; lacking focus on material efficiency and design for circularity; unsustainable product lifetimes; lack of repair services; price gap between primary and secondary material; lack of secondary material markets; insufficient collection and sorting systems; insufficient and unpredictable input quality for recycling; insufficient information about quality and quantity of materials, including knowledge about possible microplastics pollution and substances of concern, lack of communication along the lifecycle between manufacturers and recyclers; lack of involvement and empowerment of citizens that would allow environmentally informed purchases.

Projects should address the priorities set in the CEAP, which states that “electrical and electronic equipment continues to be one of the fastest growing waste streams in the EU, with current annual growth rates of 2%. It is estimated that less than 40% of electronic waste is recycled in the EU. Value is lost when fully or partially functional products are discarded because they are not reparable.” Textiles are “the fourth highest-pressure category for the use of primary raw materials and water,

after food, housing and transport, and fifth for GHG emissions, as well as one of the highest sources of emissions of synthetic microfibers in the EU. It is estimated that less than 1% of all textiles worldwide are recycled into new textiles." "In the light of the complexity of the textile value chain, to respond to these challenges the Commission will propose a comprehensive EU Strategy for Textiles." It will be necessary to boost "sorting, re-use and recycling of textiles, including through innovation", while "tackling the presence of hazardous substances". Beside the continuous implementation of the EU plastics strategy, the CEAP has a strong focus on microplastics, but also calls for mandatory recycled content and the controlled use of bio-based, biodegradable plastics and alternative materials. In view of the feasibility problems of plastic recycling, this will require the deployment of technologies that are still in their infancy, such as the various forms of chemical and enzymatic recycling.

Projects should deal with one of the three priority material streams (plastics, textiles, electronics), taking however into account the complexity of some materials currently in use (such as composites) and that the three streams are related and to some extent overlapping (plastics-textiles; plastics-electronics), and that specific solutions might require an integrated approach.

Projects should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary materials and increased share of secondary materials in new products. Projects should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Projects should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, product-service-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it is important that proposals involve and address the different perspectives of all relevant actors, e.g. manufacturers, retailers, consumers and civil society organisations (CSOs). The projects should consider the use of digital solutions and demonstrate their benefits for increased circularity. Projects should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts should be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods developed by the European Commission (Product Environmental Footprint, PEF, should be used for the assessment of the environmental impacts) and through costing methods; relevant data should be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. Considering the microplastics and microfiber pollution and hazardous substances that are present in the targeted waste streams, their removal from the materials used for the products in concern as well as from the recovered material is crucial, in addition to applying less-polluting production and consumption procedures. Decontamination levels need to be properly addressed and accumulation prevented. All achieved outcomes should be demonstrated using quantitative indicators and targets wherever possible.

Projects should also develop training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies developed. Proposals should consider the development of learning resources for the current and future generations of employees, with the possibility to integrate them in existing curricula and modules for undergraduate level and lifelong learning programmes. The projects should provide contributions to relevant standards or best practices.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-CIRCBIO-01-05: Novel, non-plant biomass feedstocks for industrial applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will contribute to the impacts of this destination and European policies it supports, in particular the European Green Deal, the circular economy action plan and the bioeconomy strategy. They should help to improve European industrial[78] sustainability, competitiveness and resource independence by lowering environmental footprint (including on biodiversity), enabling climate-neutrality and higher resource efficiency (in particular upcycling and cascading use of biomass) along and across value chains, developing innovative bio-based products. They should engage all stakeholders, and improve their knowledge and understanding of science, in particular biotechnology-based value chains.

Project results should contribute to all of the following expected outcomes:

- More effective prospecting and greater use of biological diversity to generate verifiably more sustainable biomass feedstocks, including through improved harvesting, and processing, and commercially valuable climate-neutral circular bio-based, materials and products. This covers more robust verification of sustainability via life-cycle assessment approaches.

- Greater resource efficiency of production pathways, by applying upcycling and the cascading use of biomass residues or side-streams (e.g. as growing substrates), leading to lower land dependence for biomass[79], and thus reducing any conflict with food/feed production.

- Higher capacity and engagement of SMEs, contributing to skilled job creation and economic benefits, and improving industrial competitiveness due to the expanded range of natural ingredients for the new applications in industrial sectors. Higher functional performance of the pursued value chains and products, and more sustainable industrial practices and resource independence of the EU Member States and associated countries.

78 In connection with European partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

79 Lowering the negative environmental impacts of growing biomass without use of land (zero pesticides, reduced emissions and energy use)

Better public understanding across the EU Member States and associated countries of biotechnology, and of the biodiversity conservation and enhancement objectives enshrined in the EU biodiversity strategy and respect to the principles of access and benefit sharing (UN Biodiversity Convention), via clear, inclusive and transparent communication strategies.

Scope: The innovative bioeconomy sectors need to diversify and to deliver technological and industrial solutions based on available and sustainably accessible biomass. In particular, current plant-based biorefining may need upgrading to leave more land available for biodiversity protection and food production, while allowing the substitution of fossil-based resources with bio-based ones. The scope therefore covers the production of key bio-based products such as food and feed ingredients, including proteins, lipids and fibres, antioxidants and other substances with biological activities, and key bio-based materials (e.g. bio-based plastics, composites, fibres) or chemicals[80], in a resource-efficient approach[81]. This calls for identifying and optimising sources as microorganisms, insects, fungi or mixotrophic algae, which requires defining certain growing conditions in suitable systems such as biofermentors[82], where they need to be efficiently processed, extracted and converted into industrial outputs of interest. Proposals should increase circularity, in particular for the use of biomass residues or side-streams used as feed material, and should deliver necessary upgrades to and upscaling of the strategies for the cultivation, production and extraction systems.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing research projects (especially under the Bio-based Industries Joint Undertaking or on microbiomes). Proposals should:

a. Develop and demonstrate techno-economic viability of the bio-based production platforms applying the resource efficiency principles (ensuring savings on water, energy, chemical inputs, biomass waste, side-streams or residues), getting more out of less by making use of autotrophic plants and heterotrophs, and applying the modern biotechnological principles. This covers the development of a bio-based microbial production platform for high-value biologically active substances, food/feed ingredients, or bio-based materials as well as efficient separation and extraction approaches for products of interest.

b. Identify and implement the best combination of appropriate technical solutions and practices for specific industrial value chains (justifying the choice, including on level of innovation and business viability), as well as the barriers and drivers derived from e.g. governance and market aspects, while seeking the engagement and understanding of all actors.

c. Develop and transparently communicate the key parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different sourcing, optimization and production systems, the potential of replacing available traditional alternatives, if relevant, and trade-offs, including on biodiversity, and the associated improvement in socio-economic resilience of businesses, for the creation of jobs and industrial competitiveness.

d. Develop and test mechanisms involving all actors and specifically including bio-based industries active in knowledge co-creation, exchange, feedback and communication. Demonstrate them to all actors (e.g. agricultural operators, farmers, SMEs and civil society) and help them implement

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80 Production of bioethanol and other biofuels falls outside the scope of this topic

81 e.g. by fully exploiting the cascading use of biomass resulting from agricultural production as growing substrates

82 In connection with topic HORIZON-CL6-2021-CIRCBIO-01-06 "Contained biomass solutions for sustainable and zero-ILUC production systems for high value applications"

and understand solutions for new or improved bio-based products and processes and for addressing other environmental impacts e.g. lowered pressure on land and on biodiversity sourcing.

e. Consider contributing data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by the JRC

In this topic it is not mandatory to integrate the gender dimension (sex and gender analysis) in research and innovation content.

HORIZON-CL6-2021-CIRCBIO-01-06: Contained biomass solutions for sustainable and zero-Indirect Land Use Change (ILUC) production systems for high value applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will contribute to the impacts of this destination and the European policies it supports, in particular the European Green Deal, the circular economy action plan and the bioeconomy strategy, They should help improve European industrial[83] sustainability, competitiveness and resource independence by developing innovative bio-based products. They should engage all stakeholders and improve their knowledge and understanding of science, in particular of biotechnology-based value chains, and increase benefits for consumers.

Project results should contribute to all of the following expected outcomes:

- Lower production costs, improved safety and access to final efficient, specific, high-yield and high-value, climate-neutral circular applications[84]
- Lower dependence on land-based production systems, minimising the risk of Indirect Land Use Change (ILUC)[85], with specific technical solutions and strategies for innovative, high-output,

[83] In connection with European partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

[84] e.g. production of engineered proteins such as reagents, diagnostics, innovative (e.g. scalable plant-based) vaccines or metabolites for specific industrial products (pharmaceuticals, veterinary products, biological reagents)

[85] As defined by the recast Renewable Energy Directive(EU) 2018/2001 from December 2018, and Land use and forestry regulation for 2021-203, see https://ec.europa.eu/clima/policies/forests/lulucf_en

multi-source high-value contained applications, based on a variety of biological organisms[86] and their cultivation systems and technologies involved.

- Methodologically robust verification of sustainability of the production system via life-cycle assessment approaches. This covers the greater resource efficiency of production pathways, by applying the upcycling and cascading use of biomass residues or side-streams.

- More mature and advanced biotechnology solutions for the innovative culture, screening and processing of the selected organisms, as well as the related digital applications, thus contributing to European industrial competitiveness.

- Higher engagement of SMEs, for creating skilled jobs and bringing other socio-economic benefits for end users and/or patients, through expanding the range of natural ingredients for new applications in industrial sectors, enhancing the functional performance of the investigated value chains and products, and contributing to more sustainable industrial practices and resource independence of the EU Member States and associated countries.

- Better public understanding across EU Member States and associated countries of biotechnology, and of biodiversity conservation and enhancement objectives set out in the EU biodiversity strategy and respect for the principles of access and benefit sharing (UN Biodiversity Convention), via clear, inclusive and transparent communication strategies.

International cooperation is encouraged, to allow the exchange of best practice, while ensuring win-win scenarios and contributing to European competitiveness.

Scope: The innovative bioeconomy sectors need to diversify and deliver technological and industrial solutions based on available and sustainably sourced biomass. In particular, this covers sustainable application in various industrial systems for high value products and uses, such as in the pharmaceutical, diagnostic and veterinary sectors[87], especially in the context of biorefining and other (industrial) high-value uses[88].

This calls for identifying, optimising, screening and monitoring of the growing conditions in suitable systems such as bioreactors[89,] from where they need to be efficiently processed, extracted and converted into industrial outputs of interest. The scope covers innovative multi-scale bioreactor designs, and related innovations such as hydroponics systems and phenotyping platforms for increased sustainability of biomass production, and its efficient, pathogen-free processing and use.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing research projects (under Horizon 2020 and other EU-funded initiatives). Proposals should:

a. Develop bio-based production platforms applying resource-efficient principles (ensuring savings on water, energy, chemical inputs, biomass side-streams or residues), including the study of

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86 Such as algae, fungi, plant cells, invertebrates, microorganisms, including complex multi-species communities. See a complementary topic HORIZON-CL6-2021-CIRCBIO-01-05: Novel non-plant feedstocks for industrial applications

87 e.g. antibodies, vaccines, proteins, peptides, bioactive metabolites, linking with Horizon Europe Cluster 1 Health and topic HORIZON-CL6-2021-CIRCBIO-01-05: Novel non-plant feedstocks for industrial applications

88 e.g. cosmetics, food ingredients

89 The proposals should cover size of the chosen contained systems, to enable upscaling and replication.

mixed multi-species communities, and applying modern biotechnological principles, as well as efficient separation and extraction approaches for products of interest.

b. Identify and implement the best combination of appropriate technical solutions and practices for specific industrial value chains (justifying the choice, including on business viability), as well as the barriers and drivers derived from governance and market aspects, while seeking engagement and understanding of all actors. Participation of industry and SMEs is considered essential.

c. Develop and transparently communicate: (i) the key parameters to monitor and measure the qualitative and quantitative impacts of these solutions and practices for different optimization and production systems, (ii) the potential of replacing available traditional alternatives, if relevant, and trade-offs, including with respect to biodiversity, patient perspective, and (iii) the associated improvement of socio-economic resilience of the businesses for the jobs creation and industrial competitiveness.

d. Develop and test mechanisms involving all actors and specifically including the research community and bio-based industries in knowledge co-creation, exchange, feedback and communication to demonstrate and accompany all actors (e.g. civil society including patient and other related groups) to implement and understand of solutions for improved bio-based products and processes and to address other environmental impacts. Develop specific recommendations for policy makers, while seeking involvement of broader civil society.

e. Consider contribute data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by the JRC.

For this topic, it is not mandatory to integrate the gender dimension (sex and gender analysis) into research and innovation.

HORIZON-CL6-2021-CIRCBIO-01-07: Microbiomes for bio-based innovation and environmental applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals should contribute to the impacts of this destination, and the European policies it supports, in particular the European Green Deal, the circular economy action

plan and the bioeconomy strategy. They should help improve European industrial[90] sustainability, competitiveness and resource independence by developing innovative bio-based products. They should engage all stakeholders and improve their knowledge and understanding of science, in particular biotechnology-based value chains, and increase benefits for consumers.

Project results should contribute to all of the following outcomes:

- Deeper understanding of the structural composition of microbiomes, their structure, functions, mechanisms, and potentials, as related to bio-based innovation (i.e. bio-based materials, biochemicals, products and services, including the environmental applications), as well as improved methods of their isolation and cultivation. This should lead to innovative solutions to engineer and control microbiomes and guarantee safety and efficacy for specific applications.

- Improved interdisciplinary cooperation on R&D&I between academia and industrial sectors (e.g. industrial biotechnology, food, pharma and ICT/data industries) and higher engagement of industry and SMEs.

- More systematic adoption of recent advances in molecular biology and biotechnology to increase industrial uptake of R&D&I on microbiota. This includes, in particular, their complex communities via biotechnology approaches, leading to more cost- and resource-efficient production of high-value complex molecules, lowering pressure on natural resources, or increasing their use in environmental applications.

- Greater and more inclusive understanding, awareness and trust in innovations, via societal dialogue and transparent communications with all stakeholders (academia, industry, including SMEs, NGOs, regulatory institutions, international partners etc.).

Scope: Microbiomes is the term given to the collective genomes of mixed nature-based microorganism populations. In recent years, scientific-technological progress in genome sequencing and other -omics technologies and in the bioinformatic analysis and interpretation of the data has opened up the opportunity to better understand the composition of (often difficult to cultivate with existing approaches) microbial communities, the functions and interaction of their members, and their interaction with their environment (e.g. soil) or hosts (humans, animals, plants).

The scope includes developing the methods for molecular cartography, the quantitative determination of genes and metabolites and establishing the R&D resources (e.g. inventories, catalogues, “reference microbiomes”, databases etc.). Marine microbiomes are excluded from the scope, in order to avoid overlaps with the parallel topic[91].

International cooperation is encouraged, as it can contribute to European competitiveness and resilience.

Proposals should:

a. Develop and apply a toolbox of technologies to identify, characterise and sustainably exploit (including isolation and cultivation aspects) the microbiomes and their genetic and metabolic diversity relevant for the bio-based sectors. Develop the related microbiome-based bioprocesses, e.g. to enable industrial manufacturing of high-value bio-based substances or

90 In connection with European partnerships under Cluster 6, in particular Circular Bio-based Europe (CBE).

91 HORIZON-CL6-2022-CIRCBIO-01-07: Marine microbiome for a healthy ocean and a sustainable blue bioeconomy

materials (excluding biofuels/bioenergy applications), at sufficiently large scale, or for the environmental protection applications (e.g. decomposition of persistent and hazardous contaminants or industrial, municipal waste and residues).

b. Identify and characterise the key environmental and safety aspects, and potential impacts, while adhering to the binding EU and international regulatory framework.

c. Outline the scale-up production processes for novel bio-based innovations that are necessary to reach a critical mass for a given application, to achieve economies of scale, address different market segments and potential applications, etc. This includes addressing process and product safety, including occupational and consumer safety aspects, taking into account best international practice and initiatives.

d. Ensure the transparent and inclusive engagement of all actors, including industry and SMEs, the scientific community, regulatory institutions, and broader civil society, including NGOs, to ensure the necessary impact and awareness.

e. Where relevant, proposals should seek links with and capitalise on the results of past and ongoing research projects, including on food systems, health and industrial value chains, as related to microbiomes.

For this topic, it is not mandatory to integrate the gender dimension (sex and gender analysis) into research and innovation.

HORIZON-CL6-2021-CIRCBIO-01-08: Mainstreaming inclusive small-scale bio-based solutions in European rural areas

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal objectives and the EU bioeconomy strategy, successful proposals will support innovators to scale-up inclusive and small-scale biobased solutions in rural areas contributing to regional, urban and consumer-based transitions towards a sustainable, regenerative, inclusive and just circular economy and bioeconomy across all regions of Europe at local and regional scale.

Project results are expected to contribute to all of the following expected outcomes:

- Enhanced cooperation between the key players and knowledge holders resulting in sustainable business model pathways for bio-based innovations in rural areas;
- Provision of tailored and independent support to innovators in order to accelerate the development of marketable products and services and to improve the market penetration of bio-based solutions in Europe;
- Successful deployment of existing scientific and practical knowledge and more bio-based solutions introduced in rural areas in line with relevant policy initiatives (e.g. bioeconomy strategy, European Green Deal, common agricultural policy (CAP), long-term vision for rural areas, etc.).

Scope: Europe's future economic growth and job creations will increasingly stem from innovation in products, services and business models. This is why there is currently considerable investment in research and innovation. However, there are barriers to the adoption and implementation of research results and cooperation between research, advisory services, farmers, foresters and other actors in the supply chain is not adequately supported. Regional platforms for innovation support services are needed to help European regions develop their bio-based economies and to increase awareness and knowledge about emerging opportunities as well as the environmental and socio-economic impacts relating to the valorisation of locally or regionally available biomass.

Proposals will:

- Establish regional platforms that provide innovation support services to multi-actor partnerships (e.g. farmers, foresters, clusters, business support organisations, social partners, civil society organisations including non-governmental organisations, etc.) and increase regional stakeholders' awareness and understanding of the bioeconomy, its potential and impacts, and help them build the capacity to identify innovative bio-based business models.
- Based on previous research results (e.g. BE-RURAL[92], Power4Bio[93], BioeastUp[94], etc.), activities should help match information on regionally available biomass, waste and residue streams with market information and technologies to enable full utilisation and sustainable production of bio-based products.
- Help transfer training and knowledge on better nutrient recycling in the circular bioeconomy, by identifying links between different agricultural/forestry and industrial value chains, raising awareness and sharing best practice on the use of residues as soil improvers and fertiliser in the bio-based economy.
- Consider contributing data and results to the European Commission's Knowledge Centre for Bioeconomy hosted by the JRC.

Clustering and cooperation with other selected projects under this topic and other relevant topics (e.g. HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation) is strongly encouraged.

92 https://cordis.europa.eu/project/id/818478
93 https://cordis.europa.eu/project/id/818351
94 https://cordis.europa.eu/project/id/862699

Social innovation[95] is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

HORIZON-CL6-2021-CIRCBIO-01-09: Unlocking the potential of algae for a thriving European blue bioeconomy [96]

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal objectives, EU bioeconomy strategy and blue growth strategy, the successful proposal will support the development of algae-based greener aquatic industrial products/processes and/or environmental services sustaining the health of aquatic ecosystems for a healthy planet and people.

The project results are expected to contribute to all of the following expected outcomes:

- Leveraging of the potential of algae as an industrial feedstock by upscaling and demonstrating the techno-economic viability of algae cultivation and biotransformation concepts with positive environmental, social and economic impacts. Implementation of the European Green Deal's sustainable blue economy and the EU bioeconomy strategy.
- Provide market knowledge to align the development of new algae products to the uses and needs of various sectors.
- Strengthen the competitiveness of the European blue bioeconomy and marine biotechnology industry by reducing technical bottlenecks and by developing promising business models making the whole algae sector more attractive to investment.
- Provide scientific evidence on environmental benefits - including on ecosystem services, if relevant - and on risks of algae-based cultivation. Deliver - if applicable - a comparison between the environmental footprint of algae-based products and their land based counterparts.

95 As defined by the European Commission: innovations that are social in both their ends and their means. Specifically, […] social innovations [are] new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act." according to the European Commission Bureau of European Policy Advisors (BEPA, 2011, p. 9; see also Regulation (EU) No 1296/2013on a European UnionProgrammefor Employment and Social Innovation ("EaSI")).

96 Cyanobacteria are in scope of this topic.

Scope: The farm production of micro- and macro-algae is one of the most promising emerging ocean sectors. Algae can be developed and processed into an almost endless number of products, enabling a shift to aquatic biomass production and reducing the pressure on plant biomass derived from agriculture and forestry. Total algae production in the EU increased by 76% between 2006 and 2016.

EU policy is set to unlock the versatility and potential of algae. The European Green Deal and the farm to fork strategy support the role of algae in the protein transition and its contribution to a sustainable food system. Moreover, the 2018 EU bioeconomy strategy stresses the potential of algae as a source of innovative aquatic bio-based products such as pharmaceuticals, cosmetics and fine and speciality chemicals. The integrated processing of algae offers an interesting way to exploit, profitably and sustainably, most or all of its potential, by recovering and separating the biomass components and by minimising waste production.

Applicants should carry out activities along the following lines of research:

- Demonstrate viable concepts to enable the cost-effective cultivation and processing of algae into circular bio-based products and/or environmental services (e.g. medical, cosmetics, fine and speciality chemicals, remediation). The integration with food/feed production or with other processes (such as water treatment, crop and livestock farms and carbon sequestration) could be considered if it adds to the economic, environmental and social viability of the whole concept.

- Scale-up the production of algae products and bring them closer to market by addressing key challenges such as (i) optimising strains' biology (including if relevant associated microbiomes) and the mechanisms regulating cell performance for rapid growth and high yields of novel valuable compounds; (ii) pest and disease control; (iii) standardising the product and production lines; (iv) post-harvest treatment and storage; (v) assessing risks of escape of propagules with the potential to affect local genetic biodiversity; and (vi) securing the safety of the selected applications. The efficiency and capacity of production systems should also be improved. Demonstrate downstream processing and fractionation of components that enable the practical implementation of multiproduct algal biorefineries.

- Establish European strategic development plans for the proposed algae farming that address biodiversity and ecosystems considerations. Key factors such as the carrying capacity of the European seas and the availability and use of land/light/energy should be considered; Provide estimates of the market demand for algae products and of the market structure.

- Quantified assessment of environmental benefits and risks of algae farming and products, including a comparison with land-based products. Assessment of possible ecosystem services of algae farming.

Strong weight is placed on industrial leadership in the projects. The emphasis should be on the delivery of tangible social and environmental benefits. Successful proposals should carry out a Life Cycle Assessment (LCA) of the proposed concept. Efforts should be dedicated to improve the professional skills and competences of those working and being trained to work in algae farming (e.g. through the development of training material).

Where relevant, proposals may seek synergies and capitalise on the results of projects funded under Horizon 2020, Horizon Europe, European Maritime and Fisheries Fund, its continuation European Maritime, Fisheries and Aquaculture Fund, and other funding streams.

Cooperation with other selected proposals under this topic and complementary topics included in this work programme is encouraged. This notably includes other algae-relevant topics "HORIZON-CL6-CIRCBIO-02-04-two-stage: Photosynthesis revisited: climate emergency, "no pollution and zero-emission" challenge and industrial application" and "HORIZON-CL6-2022-FARM2FORK-02-05-two-stage: Innovative food from marine and freshwater ecosystems".

Destination 4 – Clean and zero pollution environment

HORIZON-CL6-2021-ZEROPOLLUTION-01-01: Regional nitrogen and phosphorus load reduction approach within safe ecological boundaries

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: Successful proposals will support local administrations and policy makers to apply a systemic approach preventing pollution from nitrogen and phosphorus, in line with the zero pollution ambition. Project outcomes will contribute to maintaining nitrogen and phosphorus flows well within safe ecological boundaries at EU, regional and local scale and to restoring ecosystems. Project results are expected to contribute to all of the following expected outcomes:

- Harmonised environmental protection policies and implementation actions delivered by local administrations and policy makers to achieve nitrogen and phosphorus load reduction targets at regional/river basin level.
- Best practices shared in EU and Associated Countries to prevent pollution from nitrogen and phosphorus emissions to air/soil/water including the design of inter-sectorial governance models and policy implementation tools to deploy the concept of nitrogen and phosphorus load reduction targets.
- Improved knowledge on the physical science of climate change.

Scope: The quantification of nitrogen and phosphorus emissions reduction necessary to respect ecosystems' health in order to achieve the objectives of EU legislation and the 2030 targets of the

biodiversity and farm to fork strategies may be assessed through a nitrogen (N) and phosphorus (P) load reduction targets approach. The scope of the topic is to develop a regional/river basin approach. The topic is targeted to stakeholders from regions/river basins or clusters of regions/river basins: local agencies of environmental protection, local administrators, scientists and experts in environmental impacts models. A cluster may be formed by two or more regions/river basins, in the EU and Associated Countries, with very similar characteristics in terms of territorial conditions or being neighbouring regions/river basins.

Proposals will:

a. Develop a robust and transparent methodology to identify safe ecological limit values (e.g. concentration in media) of N/P applicable at regional scale to ensure good status for ecosystems in air/water/soil, inside and outside the local scale and apply the methodology to regions/river basins of the consortium. The local territorial specificity will be taken into account, in terms of territorial extension, land use, orography, distribution of basins and fresh water bodies, coastline, lagoons, etc. A coherent set of environmental indicators and their limit values at local scale will be selected for each region/river basin, based on legislation, existing and announced objectives and on scientific evidence, including datasets from the long-term environmental monitoring campaign and tools[97]. Indicators of N/P limit values should align to the monitoring capacity of N/P patterns in the environment.

b. Review scientific knowledge of the contribution of N/P flows to climate change, including their impacts on carbon sink capacity of soils, of any other impact of N/P life cycle in the environment, of short-term and long-term dynamics of P in the soil matrix and its regional variation across the EU;

c. Develop and/or improve an existing methodology to assess N/P emissions (flows) from all economic activities that may exist in the region/river basin (i.e. agriculture, aquaculture, forestry, industrial sectors, including food/drink sector, water supply, water/waste management, bioenergy, fossil-based energy production, mining activities, transport, etc.) including unintentional losses (e.g. losses and run-off of agricultural nutrients into the soil) and their impacts on air/water/soil environmental quality. Apply the methodology to regions/river basins of the consortium. Data from existing initiatives, consolidated reporting from national authorities, elaboration from EEA, Eionet, ESTAT, etc. and existing modelling capacity, either locally available or based on a twinning process across regions/clusters shall be considered in order to facilitate harmonisation of the approaches;

d. Develop and/or improve an existing methodology to identify the N/P load reduction targets for all regions/river basins of the consortium to stay within local N/P limit values;

e. Apply existing[98]/develop new methodologies to model pathways to reduce N/P emissions to meet load reduction targets and at the same time prevent pollution in air, water and soil, contribute to climate change mitigation, protect biodiversity and avoid pollution swapping. Pathways may include but are not limited to: i) integrated land/marine and bioeconomy; ii) limiting livestock stocking density; iii) integrated agricultural practices, including agro-ecology, aiming at limiting N/P flows and any other environmental impacts; iv) nature-based solutions

97 For the atmospheric compartment the JRC has developed the global emissions database EDGAR (https://edgar.jrc.ec.europa.eu) and the FASST (https://tm5-fasst.jrc.ec.europa.eu) modelling tool,

98 For example Blue 2: https://ec.europa.eu/environment/blue2_en.htm

(e.g. in waste water treatments, soil remediation); v) integrated industrial innovation towards circularity, industrial symbiosis and innovative resources use to improve efficiency and reduce N/P emissions from industrial sectors and any other environmental impact;

f. Identify inter-sectorial governance models and design policy implementation tools at regional level, also to integrate policy requirements for environmental legislation and emission sources from many sectors, including measures to foster a systemic shift in societal aspects (e.g. approaches to address meat consumption, food waste prevention, greener mobility, consumers' awareness of environmental footprint of goods etc.).

Proposals should include a task dedicated to sharing methodologies and findings with projects funded within this topic. If projects use satellite-based earth observation, positioning, navigation and/or related timing, they must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

HORIZON-CL6-2021-ZEROPOLLUTION-01-02: Optimisation of nutrient budget in agriculture

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: In line with the zero pollution action plan and the farm to fork strategy, the successful proposal will support to limit and reduce pollution due to the excess of nutrients and nutrient losses (especially nitrogen and phosphorus) in the environment, stemming from excess use in agriculture. It will contribute with new and enhance knowledge to the development of integrated nutrient management plan.

Project results are expected to contribute to all following expected outcomes:

- Improve nutrient budget and flows by identification of optimal combinations of nutrients in different farming systems (conventional, agro-ecological and organic systems) following, when possible, a holistic approach of the plant and animal productions system.

- New approaches and methods supported with sound indicators to monitor and measure nutrients flows and practices with the greatest climate change mitigation potential and water and nutrient leakages, and biodiversity preservation while ensuring economic farm viability.

- Identification and targeted implementation of individual or combined region-specific agricultural practices that help balance nutrient cycles and Nature Based Solutions for plant and animal nutrition and health optimizing the use of external inputs and implementation of regulated deficit strategies.

- Quantification of the potential to save particularly N and P emissions from the implementation of relevant individual or combined agriculture practices, e.g. organic agriculture, agro-ecology, conservation agriculture, improve organic and mineral fertilization management, etc., that enhance soils health and combat eutrophication and water pollution.

- Improved nutrient budget at different scales, by sound quantification of the inputs and outputs of water and nutrients in different agricultural systems including quantitative environmental and economic indicators for farms, regions and/or products.

- Enhanced models to identify contamination and pollution hotspots locally, to extrapolate to regional, national and global solutions.

- Strengthened transdisciplinary and interdisciplinary research and integrated scientific support for relevant EU policies and priorities (common agricultural policy (CAP), Green Deal, the zero pollution action plan, the farm to fork, etc.).

Scope: Sustainable agricultural production systems not only deliver nutritious food and other raw materials, they are also key drivers of economic growth in rural areas. Roughly 25% of the annually produced terrestrial agricultural biomass is used by humans, about 70% [99](mostly from grassland, by-products, and inedible crop residues) converted through animals into food and manure, and the remainder goes into biofuel. Unsustainable agricultural systems can cause a variety of adverse environmental effects, such as climate change, loss of biodiversity, and air and water pollution due to poor management of nutrients.

When possible, the holistic consideration of plant and animal nutrition within the agricultural production systems could contribute to more sustainability of the food chain by promoting the minimization of nutrients leakage and improved nutritional values of fertilisers, feed and food. This approach could cover the basic nutritional elements (carbon, hydrogen, nitrogen, oxygen), the macro elements (phosphorous, potassium, magnesium, calcium, sulphur) but also the trace elements (zinc, copper, iron, iodine, selenium, manganese). In line with the European Green Deal, the development of a nutrient budgeting approach could focus on the fluxes of carbon (C).

However, there are substantial knowledge gaps regarding the measurement and understanding of the impacts of nutrients flow in different farming practices (conventional, agro-ecological and organic systems, specialised and mix farming systems) at various scales, from local to global, and the capacity to model those impacts.

[99] A nutrient budget quantifies the inputs and outputs of nutrients in a system and can be used to understand better how the system soil-water-plant-nutrients works, and provide quantitative environmental and economic indicators for farms, regions and products.

Proposals should build on existing and new knowledge, data, models (including in situ calibration measurement), artificial intelligence and tools to:

- Optimise and harmonise nutrient and water flow models, indicators and data for quantification and assessment to prevent or reduce environmental pollution caused by nutrients, across sectors, for different types of agricultural practices (conventional, organic and agro-ecological agriculture), and scales – farm, local, regional and river basin.
- Explore and assess safe alternative nutrient sources and pathways (e.g. organic vs inorganic), enhance management and recycling of organic wastes and explore nutrient recovery opportunities (e.g. by using treated sewage sludge or wastewater) as well as nutrient mobilisation through microorganisms;
- Build upon available results from previous EU projects funded under the Horizon 2020 topic CE-RUR-08-2018-2019-2020: Closing nutrient cycles.
- Enhance nutrient use efficiency at different levels.
- Analyse climate change effects of certain nutrient flows, including interactions between nutrient, water and carbon cycles.
- Develop biological models for nutrients flows remote sensing tools, in agricultural systems: for physical, chemical and biological parameters, using smart sensors and AI technologies.
- Develop digital platforms to allow precision nutrient management at farm scale and landscape scale.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector and, as relevant, bio-based industry active in rural areas.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-ZEROPOLLUTION-01-05: Environmental sustainability criteria for biological resources production and trade in bio-based systems: impacts and trade-offs

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7-8 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will support tracing environmental impacts of biological resources production and trade by primary producers, traders and certification companies to enable responsible production in the industrial bio-based systems, in line with the 2030 Climate Target Plan and the zero pollution ambition. Project outcomes will contribute to establish circular bio-based systems reversing climate change, restoring biodiversity and protecting air, soil and water quality along supply chain of biological resources and industrial value chains, within the EU and across borders. Project results are expected to contribute to the following expected outcome:

- Certification schemes for international trade at EU and global scale of biological resources for bio-based systems include the environmental impacts and trade-offs along the bio-based supply chains.

Scope: Assessment of environmental sustainability of biological resources production and trades in the bio-based systems is still a challenge. Indicators of such sustainability should build on dynamic perspectives at scales ranging, in space, from planetary to local ecosystems and, in time, from next decade to the end of century and beyond.

Proposals should:

a. Identify the range of biological resources intended for industrial bio-based systems at EU and local (regional/rural/urban/coastal) scale, including primary biomass resources production and biological secondary raw materials from rural/urban/industrial activities. Industrial bio-based systems do not include food/feed, biofuels, bioenergy and cultural/recreation sectors. However, relevant initiatives in the field of assessment and certification of environmental sustainability of biological resources arising from EU policies in the bioeconomy sectors should be taken into account. Aspects of trade of biological resources within the EU and at global level should be part of the analysis.

b. Collect data and figures on volumes of biological resources identified under a) in global trade flows and imports into the EU and their geographic distribution. The data collection should be based on existing and consolidated statistics and market databases.

c. Improve existing and/or develop new methodology for the assessment of the environmental impacts and trade-offs of biological resources in the scope addressing, but not limiting to, the following environmental categories: i) GHG emissions/savings and carbon footprint; ii) emissions from nitrogen and phosphorous based fertilisers; iii) land use and land use change and its related impact on land carbon sink capacity; iv) marine space use and marine space use change; v) water use; vi) biodiversity and ecosystem services; vii) energy consumption, viii) any other aspects of air/water/soil environmental quality. Assessments should consider the life cycle perspective and relevant regulatory requirements in terms of trade (across and within the EU), to the extent possible. Trade-offs and synergies with food production, nature-based solution to protect biodiversity or other resources use and ecosystem services (e.g. recreation, urban creep) should be included in the assessment;

d. Align methodology in c) with indicators (e.g. environmental, demographic, geophysics indicators) provided by consolidated and available database, including networks of environmental observations, efficiently.

e. Adapt methodology in c) to be suitable to definition/identification of environmental sustainability criteria compliant with the format of certification schemes in terms of either adopting existing certification schemes or developing of ad hoc ones. Criteria should be aligned with the Commission's Taxonomy Regulation[100]. Traceability of biological resources at European and global scale should be essential part of certification.

f. Demonstrate the developed methodologies for the assessment of environmental impacts and trade-offs, sustainability criteria and certification schemes to a range of biological resources intended for industrial bio-based systems in an operational environment and deliver guidelines.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Proposals' consortia should involve primary producers of biological resources, trade bodies, bio-based industries, agencies/companies developing certification, consumers' organisations and any stakeholder along the supply chain of biological resources for bio-based industries.

HORIZON-CL6-2021-ZEROPOLLUTION-01-06: Increasing the environmental performance of industrial processes in bio-based sectors: construction, woodworking, textiles, pulp and paper and bio-chemicals

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will support circular bio-based systems in industrial sectors in line with the European Green Deal and its zero pollution ambition and 2030 Climate Target Plan by increasing the environmental performance and sustainability of processes, and their ability to reverse climate change, restore biodiversity and protect air, water and soil quality along industrial value chains, within EU and across borders.

Project results are expected to contribute to the following expected outcome:

- Improvement of the environmental performance of industrial processes in the following bio-based sectors: construction, woodworking, textiles, pulp and paper, and bio-chemicals.

Scope: Proposals under this topic should focus on all of the following industrial bio-based sectors: construction, woodworking, textiles, pulp and paper, and bio-chemicals.

[100] Regulation on the establishment of a framework to facilitate sustainable investment (EU) 2020/852

Proposals should:

a. Identify and analyse case studies for each aforementioned industrial bio-based sector at the local (regional, rural, urban or coastal) or international scale within the EU and Associated Countries, and collect data and figures on the environmental performance of industrial processes in these sectors.

b. Improve existing and/or develop new methodologies to assess the environmental impacts of these processes. The assessment should use, when possible, the Life Cycle Assessment methodology (in line with the existing international standards, the European Commission's Product Environmental Footprint method[101] and other relevant sources of information), and include, but not limited to, the following environmental impacts: GHG emissions and carbon footprint, emissions to air/water/soil, water and primary energy use, biodiversity and ecosystem services. The assessment methodology should also look at social and economic aspects. Relevant data may feed into the European Platform on Life Cycle Assessment[102].

c. Assess and analyse the environmental impacts and trade-offs of bio-based processes identified in a) based on the methodology developed in b).

d. Identify and evaluate possible solutions to improve the environmental performance of bio-based processes based on c). The aspects to be evaluated include, but are not limited to the following: GHG emissions reduction, resource and energy efficiency, shift to renewable energy sources, enhanced circularity of materials (including upcycling and cascading use of biomass), non-toxic substances used in the processes, replacement of toxic substances with non-toxic ones, minimisation of residual waste at all phases of the processes, efficient recovery of any waste and residual flows.

e. Demonstrate, where possible, the best solutions identified under point d) in order to evaluate their effectiveness and assess monitoring procedures.

f. Develop recommendations and guidelines to improve the environmental performance of processes in each of the aforementioned industrial bio-based sector. These should include a prioritisation of solutions and recommendations for modifications in specific processes and preliminary indications for monitoring procedures.

Proposals should include a task dedicated to sharing methodologies and findings with projects funded within this topic. Moreover, they should build synergies with research and innovation projects funded under Horizon Europe notably under "HORIZON-CL6-2021-ZEROPOLLUTION-01-05: Environmental sustainability criteria for biological resources production and trade in bio-based systems: impacts and trade-offs", and where relevant, seek complementarities and capitalise on the results of other past and ongoing research projects (especially under the Bio-based Industries Joint Undertaking).

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

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101 https://ec.europa.eu/environment/eussd/smgp/dev_methods.htm

102 https://eplca.jrc.ec.europa.eu/

HORIZON-CL6-2021-ZEROPOLLUTION-01-07: International and EU sustainability certification schemes for bio-based systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The successful proposals will support tracing environmental impacts along value chains and trades in the bio-based systems for business-to-business communication to enable responsible production and consumption, in line with the 2030 Climate Target Plan and the zero pollution ambition. Project outcomes will contribute to establish circular bio-based systems reversing climate change, restoring biodiversity and protecting air, soil and water quality along supply chain of biological resources and industrial value chains, within the EU and across borders.

Project results are expected to contribute to all of the following expected outcomes:

- Bio-based value chains transparency in international and EU trade is enhanced through business-to-business labels of biological resources and bio-based materials and products.
- Harmonization of existing international and EU certification scheme and the monitoring system and indicators of their effectiveness and robustness.

Scope: Climate neutral circular bio-based systems have the potential to establish a zero-pollution economy provided that they are developed sustainably. Environmental, social and economic impacts and trade-offs should be traced along value chains and trades to enable responsible production and consumption. Activities under this topic should assess scope, potential and requirements of international and EU sustainability certification schemes and business-to-business labels applicable to biological resources including primary biomass resources and bio-waste and residues intended for bio-based industrial value-chains and to bio-based materials and products, also in complementarity with actions on bio-based innovation and market measures. Industrial bio-based systems do not include food/feed, biofuels, bioenergy and cultural/recreation sectors. However, relevant initiatives in the field of assessment and certification of environmental sustainability arising from EU policies in the bioeconomy sectors should be taken into account. Traceability of biological resources and bio-based materials and products on a business-to-business level, at the EU and the global scale, should be part of certification, including aspects on primary and secondary biomass and bio-based intermediates in global trade flows and imports into the EU.

Proposals should:

a. Review and analyse existing international and EU sustainability certification schemes and business-to-business labels for biological resources. The analysis should encompass schemes applied/applicable to biological resources intended for industrial bio-based value chains. Certified environmental, social and economic impacts and trade-offs should be analysed. Bio-

waste and any biological secondary raw materials from rural/urban/industrial activities are included in the definition of biological resources.

b. Collect data and figures on volumes of biological resources and bio-based materials and products in global trade flows and imports into (exports from) the EU and their geographic distribution, distinguishing between certified and uncertified resources and materials/products. The data collection should be based on existing and consolidated market databases.

c. Review and analyse existing international and EU sustainability certification schemes and business-to-business labels for bio-based materials and products with the same level of detail apply to the analysis of resources (point a).

d. Assess existing/develop new monitoring system and indicators of effectiveness and robustness of existing certification schemes and labels reviewed in point a) and c). The task should consider the life cycle analysis perspective and identify minimum requirements of a certification scheme to ensure its completeness covering environmental, social and economic aspects.

e. Demonstrate/test effectiveness of existing (voluntary) certification schemes and labels and monitor their robustness; this action includes testing the monitoring system and indicators assessed/developed within the project, point d, on the reviewed schemes, point a) and c). The results should consolidate the optimal monitoring system and indicators and provide a preliminary selection of (parts of) the certification schemes covering the minimum requirements identified in point d). The same for labels.

f. Assess costs from the adoption of certification schemes and labels in selected industrial bio-based value-chains. The assessment includes selecting a range of value-chains in the EU and Associated Countries and the corresponding biological resources and flows of materials and products among those certified and reviewed in point a and c and collecting data and figures on the known costs: actual economic and internalised environmental and social ones. The evaluation of the externalised environmental and social costs should be part of the overall assessment, based either on primary data or/and on models taken from peer-reviewed literature in the related fields of economy, social and environmental sciences.

g. Evaluate the feasibility of business-to-business labels that award best performances either of resources or material or products from either environmental or social aspects. The feasibility should include modelled economic costs and benefits.

h. Analyse and develop recommendations on how to promote the best practices in the adoption of effective and robust certification schemes and business-to-business labels. Promoting actions may include deployment and take-up by industrial sectors of certification schemes, building trust between business stakeholders, deploying corporate responsibility, engagement with and awareness of bio-based sectors.

i. Engage in cooperation with international partners and organisations, to increase impact and outreach, while ensuring sufficient focus on the EU's situation.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Proposals should include a task dedicated to sharing methodologies and findings with projects funded within this topic. Proposals' consortia may include, but not be limited to, experts in certification schemes and stakeholders of the international and EU trade of biomass resources and bio-based materials and products.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-ZEROPOLLUTION-01-08: New genomic techniques (NGT): understanding benefits and risks – focus on bio-based innovation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal will contribute to Destination 'Clean environment and zero pollution' impacts, and European policies it supports, in particular the European Green Deal, the circular economy action plan and the bioeconomy strategy, and specifically in respect to circular bio-based systems in industrial sectors along value chains and supply chains of biological feedstock, within Europe and globally, as well as to delivering the innovative "zero-pollution" bio-based biotechnology solutions.

Project results should contribute to all of the following outcomes:

- Improved understanding of the benefits and risks of new genomic techniques applied for plants[103] and/or animals[104] and microorganisms and consequences for human health and the environment (e.g. environmental balance, biodiversity impacts), aiming at a holistic approach[105].
- Advancing the potentials of the new genomic techniques (via technical and social innovation)
- Contribution to an improved and more inclusive understanding and awareness, through transparent communication of the risks and benefits of the new genomic techniques and resultant innovation, while supporting societal dialogue and engagement with all stakeholders (academia, industry, including SMEs, NGOs, regulatory institutions, international partners and consumers or civil society to ensure public knowledge and awareness).

103 Such as ensuring molecular containment of genetically modified crops

104 Such as related to gene-drive eradication of vectors of human and animal pathogens, e.g. malaria

105 E.g. development of long-term environmental and population models concerning the spreading into the environment of organisms obtained by NGTs, taking into account the climate change issues.

Scope: There is a need to enable major advances in the life sciences and biotechnology, in new genomic techniques, such as gene/genome editing[106]. This aims to ensure they can contribute safely and sustainably addressing the grand societal challenges of our age, such as climate change mitigation and adaptation, improved resource efficiency by industry and throughout various sectors of the economy. This covers their applicability for bio-based sectors (e.g. development of improved and more resilient feedstocks, plants and livestock to achieve a more efficient use of resources, longer shelf life of the agricultural products, products or agricultural by-products rendered more reusable). These advances must be aligned with the relevant EU legal framework[107], while aiming to support the climate ambition of zero net emissions by 2050, as well as biodiversity protection and resource efficiency goals. A key aspect should be the combination of safety, environmental sustainability and functionality of the developed products. It needs to recognize the need for a holistic approach at the ecosystem level, for both conventional and alternative production systems. R&I activities should result in solutions to develop safe and more environmentally friendly products, allowing for innovation, transparency and inclusiveness for all actors.

International cooperation is strongly encouraged, to exchange best practice, while contributing to the European competitiveness.

Proposals should:

a. Advance new genomic techniques in bio-based innovation (purely medical applications such as the therapeutical/clinical applications are excluded), to understand and increase their impact, as related, for instance, to the origin of feedstocks and its other features and its applicable conversion pathways (e.g. via biorefinery processing), storage, logistics, enhanced functionalities and environmental sustainability, safety/non-toxic nature and improved end-of-life behaviour (e.g. reuse/reprocessing), etc. for specific applications.

b. Develop future scenarios taking into account in different environmental, social and economic drivers, to assess potential critical impacts and bottlenecks with respect to the EU and international governance frameworks. This should take into account the expected demand of primary resources needed to satisfy the growing bio-based economy (especially sustainable biomass), the need to protect and restore biodiversity, as well as the increasing environmental pressures under climate change conditions.

c. Develop new approaches to design innovative aspects of the production process, screening procedures, molecular tools and digital applications.

d. Outline the necessary scale-up production processes for novel bio-based innovations in order to reach a critical mass for a given application, to achieve economies of scale, address different market segments and applications, etc.

e. Ensure transparent and inclusive engagement of all actors, including industry and SMEs, scientific community, regulatory institutions, and broader civil society, to ensure necessary impact.

f. Where relevant, proposals should seek synergies and capitalise on the results of past and ongoing research projects.

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106 Including, if relevant, epigenomic control mechanisms

107 Including the EU Court of Justice judgment in Case C-528/16, http://curia.europa.eu/juris/documents.jsf?num=C-528/16

For this topic, it is not mandatory to integrate the gender dimension (sex and gender analysis) into research and innovation. This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-ZEROPOLLUTION-01-09: Environmental impacts and trade-offs of alternative fertilising products at global/local scale.

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The successful proposals will support awareness of environmental performances of alternative fertilising products and their uptake by stakeholders and local administrators, in line with the zero pollution ambition. Projects outcomes will contribute to maintaining nitrogen and phosphorus flows well within safe ecological boundaries at the EU, regional and local scale and to restoring ecosystems.

Project results are expected to contribute to all of the following expected outcomes:

- Orienting the production and the application of alternative fertilising products according with the best environmental performances and practices.
- Local administrations formulate policies to support the development of sustainable local value chains deploying alternative fertilising products.

Scope: The scope of this topic is the assessment of environmental impacts and trade-offs of the production and application of a range of fertilising products derived from secondary raw materials which could replace nitrogen- and phosphorus-based fertilisers produced from conventional processes (including mining and fossil-based processes) in a life cycle perspective. Examples of alternative fertilising products within the scope include products made from secondary raw materials such as, for example: recycled nutrients from urban and industrial waste water and sewage sludge, organic fertilising products from bio-waste, from any biological residue or by-products, from digestate and from treated manure.

Proposals should:

a. Collect all relevant data and figures on a range of fertilising products derived from secondary raw materials. Information should include all phases of their life cycle: production, distribution/trade, storage, application on lands and consequent transformation/diffusion into the different environments. The range of alternative fertilising products should be selected in order to cover at least one product from each main waste/residue raw material, i.e. at least one from each of: urban waste water, industrial waste water, sewage sludge, bio-waste, biological by-products, digestate and treated manure.

b. Apply and/or improve existing methodologies to assess the environmental impacts and trade-offs of the alternative fertilising products selected at point a) on a life cycle base, building on and complementing existing assessment results published by European Commission (project SAFEMANURE[108]). In particular, methodology and assessment should include the territorial and practical factors in terms of local vs global production and trade, local management procedures (storage, spreading on soils) also depending on specific agricultural applications and practices (e.g. agro-ecological vs traditional approach, current legislation at national level, within the consortium). Impacts and trade-offs should include categories on: climate change mitigation, including in terms of restoring the carbon sink capacity of soils, biodiversity and ecosystems protection, including soil biodiversity and below-ground ecosystems, land use and land use change, water consumption, energy use, nitrogen and phosphorus flows into the environment and any other pollutants' emission that affect air/water/soil, including microplastics. Methodology and assessment should rely on existing procedures, e.g. Product Environmental Footprint method[109]and other validated/certified modelling and objective techniques, experimental tests, consultation of peer-reviewed scientific literature;

c. Relevant data may feed into the European Platform on Life Cycle Assessment[110] if feasible;

d. Analyse technical aspects of the environmental impacts prevention and control operations during all phases of life cycle of the selected alternative fertilising products and their effectiveness. Include preliminary assessment of costs of installation/maintenance and social benefits of such operations. Alternative fertilising products under this proposal seeking market regulatory approval, should consider relevant regulatory requirements.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Activities should include a thorough analysis of past research projects and studies developed under the EU funding programmes. Proposals should include a task dedicated to sharing methodologies and findings with projects funded within this topic. Proposals' consortia should include stakeholders from the whole value chain such as producers of fertilisers and farmers, as well as scientists and experts in the analysis of environmental impacts of agricultural products.

HORIZON-CL6-2021-ZEROPOLLUTION-01-10: Environmental services: improved bioremediation and revitalization strategies for soil, sediments and water

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 11.00 million.

108 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/technical-proposals-safe-use-processed-manure-above-threshold-established-nitrate-vulnerable

109 https://ec.europa.eu/environment/eussd/smgp/dev_methods.htm

110 https://eplca.jrc.ec.europa.eu/

Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal and its zero pollution ambition and Climate Pact, the successful proposal should support circular bio-based systems reversing climate change, restoring biodiversity and protecting soil and water quality along the supply chain of biological feedstock and industrial value chains, within Europe and globally, as well as deliver innovative "zero-pollution" bio-based biotechnology solutions and advanced bioremediation methods for environmental protection.

Project results should contribute to all of the following outcomes:

- Improved bioremediation and revitalization strategies for contaminated environments, including soil, sediment, surface water and groundwater using recent advances in biotechnology;
- New approaches for efficient bioremediation and resource recycling;
- Provide science-based evidence and bio-based solutions enabling a better assessment of pollution threats from pollutants' remobilisation to soil, sediment, surface water and groundwater;
- Reduce the main negative impacts of pollution in terms of loss of biodiversity and ecosystem services;
- Validated newly developed and effective bioremediation methods in different environmental conditions, also based on microbiome exploitation potential;
- Improved overall environmental performance (soil and sediment health, water quality, reduction of emissions, etc.);
- Improved environmental footprint and lower toxicity of processes, products and services by means of biotechnologies;
- Advanced assessment of effective methods of bioremediation with improved environmental, economic and social sustainability.

Scope: Environmental pollution has been a major concern over the past few decades influencing the quality of life. Contamination of soils, sediments and water remains a major ecological problem. This pollution contains dangerous and persistent toxic substances that have adverse effects on human health and the environment. Pollutants resulting from human activity are detrimental to ecosystems at different functional levels, representing an important economic burden for society.

Remediation strategies, such as chemical and physical approaches, are not enough to mitigate pollution problems. Bioremediation using microbes is a sustainable, eco-friendly and socially acceptable alternative to conventional remediation approaches and helps improve the environment. It plays a significant role in monitoring "Zero-pollution". Many microbes with bioremediation potential have been isolated and characterised but, in many cases, cannot completely degrade the targeted environmental pollutant or are ineffective in situations with complex contamination such as mixed waste.

The topic aims at improving bioremediation and revitalization strategies for soils, sediments, surface water and groundwater while respecting the EU legislation and regulations applicable in this area, including the use of naturally occurring and optimised organisms.

Proposals should:

a. Identify and analyse optimised proteins, microorganisms, microbiomes, plants, and animals (specifically fish and molluscs/bivalves including mussels) for sediment, watershed and wastewater remediation and revitalization (e.g. novel enzymes to degrade xenobiotic small molecules such as toxins, antibiotics and microplastics, selective uptake of non-degradable metal toxins, bioadsortion);

b. Identify and characterise plant platforms, microorganisms and microbiomes that can be optimised for efficient remediation of a range of contaminated environments (e.g. enzymes optimised for efficient bioconversion and/or biosequestration of environmental contaminants, biological tools/systems for land-based bioremediation, phytoremediation for contaminated industrial sites);

c. Identify and characterise plants transformed with pathways and metabolisms that enable the uptake of targeted contaminants and that have clearly visible 'markers' for public surveillance (for example, colours that clearly mark the plant as being genetically modified, so as to prevent people from eating these plants);

d. Develop strategies for efficient metabolic pathways of naturally-occurring species to be re-introduced into the environment;

e. Develop sustainable and cost-effective technologies for bioremediation of water resources used for water production and effective in situations with mixed waste (e.g. nature-based solutions)[111, 112]; and/or develop sustainable and cost-effective technologies for bioremediation of soil resources, including those effective in situations with mixed waste;

f. Enable new microbial approaches, such as combinations of synthetic auxotrophies, that increase the safety and reduce the risk of deploying optimised microbes in the field;

g. Develop and analyse the ability of defined consortia of bacteria, fungi algae and/or other organisms to most productively revitalise soil, sediment and water sources (for example, by researching functioning of ecosystems in the hyporheic zone, which plays a crucial role in the purification of bank filtered water and thus in ensuring a safe supply of drinking water in several countries);

h. Identify and assess (with quantification) the key environmental, economic, social and safety benefits of bioremediation and revitalization strategies for soils, sediments, surface water and groundwater compared to standard physicochemical remediation approaches;

111 The EU and nature-based solutions (link)

112 What nature-based solutions can do for us (link)

i. Where relevant, proposals should seek synergies and capitalise on the results of past and ongoing research projects [113, 114]

For this topic, it is not mandatory to integrate the gender dimension (sex and gender analysis) into research and innovation

Destination 5 – Land, ocean and water for climate action

HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 20.00 and 126.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Programme Co-fund Action
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. As financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives, the 60 000 EUR threshold provided for in Article 204 (a) of the Financial Regulation No 2018/1046 does not apply.
Total indicative budget	The total indicative budget for the duration of the partnership is EUR 126 million.

Expected Outcome: In support of the European Green Deal and EU water-related policies, the successful proposal will contribute to foster the adaptation of water resources to climate change, contributing therefore to Destination 'Land, ocean and water for climate action' impact "Advance the understanding and science, and support adaptation and resilience of natural and managed

113 Horizon 2020 call CE-BIOTEC-04-2018: New biotechnologies for environmental remediation (RIA)

114 Horizon 2020 call CE-BIOTEC-08-2020 : New biotechnologies to remediate harmful contaminants (RIA)

ecosystems, water and soil systems and economic sectors in the context of the changing climate", as well as preserve and restore ecosystems and biodiversity, prevent pollution in land and seas, enhance food security, foster sustainable and circular management of water resources and innovative governance.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased protection of water resources and ecosystems and strengthening of biodiversity, by developing a more systemic and integrative policy which considers cross-sectoral interactions (water, biodiversity, agriculture, fisheries and aquaculture, energy, health).

- Enhanced resilience, mitigation and adaptation of water systems to climate change and multiple interacting stressors.

- Pooled resources (EU, Member States, Associated Countries, European platforms and economic sectors) and alignment within a shared and co-developed strategic research and innovation agenda (SRIA) and related implementation plans and better embedding of national and regional knowledge and innovation ecosystems within that of the EU.

- Leverage impacts of policies on the water security crisis, by upscaling projects (from research to demonstration) and supporting policy implementation based on cooperation, across stakeholders and sectors.

- Strengthened alignment between funders' programmes and timelines and knowledge transfer, and addressing the lack of continuity of funding from research to implementation and difficulties in securing long-term investments.

- Greater cooperation across sectors, with multi-stakeholder engagement and empowerment, to co-develop and co-implement solutions and to drive the necessary societal transformations required for securing water for all.

- Reinforced role of the EU in the international water agenda (implementation of UN SDGs) and in strengthening water diplomacy.

- Science and evidence-based implementation of the European Green Deal and EU water-related policies.

Scope: Water resources are vital for all human activities and the environment. Ensuring that enough water of high quality is available for all purposes remains a key challenge globally and within Europe.

Global trends project world-wide growth in water use by 55% by 2050, due to growing demands from manufacturing, thermal electricity generation, agriculture and domestic use, all increasing the pressure of human activities on our freshwater resources. Furthermore, water quality is declining due to agricultural, industrial, mining and urban pollution, impacting the availability of water of sufficient quality for users. According to the recently released Global Assessment by the Intergovernmental Platform for Biodiversity and ecosystem services (IPBES), freshwater biodiversity is declining rapidly. Hydrological extreme events, such as floods and droughts, are going to increase, according to the latest IPCC conclusions, exacerbating the water crisis and impacts across all economic sectors.

Achieving good status of Europe's surface waters and providing enough water for all, is not only important for the implementation of EU water related policies, it is also an essential element for achieving other EU related policies, such biodiversity, agriculture, climate and energy related policies. Water is also central to all components of the European Green Deal. There is, therefore, a need to produce science-based knowledge to support the European Green Deal and other EU policies by monitoring problems related to water and developing feasible technical and managerial solutions.

Water is a dedicated UN Sustainable Development Goal (namely SDG6) but it will not be achieved by 2030 at current rates, considering trends in financing, capacity and political commitments. This will also undermine progress towards most of the other SDGs, particularly the goals related to poverty, hunger, health, clean energy, cities, climate, life below water and life on land, but also gender equality and peace, which are all related to water.

The diversity of challenges we are now facing to secure water for all, requires a new co-funded partnership that brings together all public and private research funders and supports a more efficient collaboration and integration of EU, Member States and Associated Countries R&I activities related to water. This will ensure a transition to a healthy planet, respectful of planetary boundaries, a resilient Energy Union, and implementation of an EU policy of climate neutrality, in line with Horizon Europe priorities.

It also requires the alignment and/or integration of different research and innovation agendas and of EU and national programmes, coordination of funding agencies and commitments to implement a long-term strategy that would deliver major changes and impacts. Based on a shared and co-constructed SRIA, such a partnership should combine bottom-up and top-down approaches to reconcile needs whilst pooling resources from different sources. It should foster consortium building and help leverage between existing initiatives under common broader or specific objectives. This will give direction and shape to a common water implementation strategy.

A European partnership is also necessary to deliver an objective and impact-driven approach and build critical mass in resources (human and financial), expertise and capacities in the longer-term, in line with the challenge faced. This would allow for the mobilisation of additional national resources with access to other instruments / financing / investments along the same strategic research agenda (e.g. real-life testing sites, research infrastructures, and innovation hubs or competitiveness clusters), contributing from collaboration that benefits existing European, national and local ecosystems.

Tackling the global challenges also requires different forms of cooperation (to maximise the types and number of partners involved). This would allow implementation of a larger range of types of actions, such as development of academic and applied research, innovative solutions, including collaboration with enterprises in projects, transfer of innovation to enterprises, addressing the science/policy interface, while having better access to research infrastructures and connections to implementation tools (financial, regulatory), demonstration and training.

The co-funded European Partnership Water Security for the Planet (Water4All) should address the following vision: "Boosting the systemic transformations and changes across the entire research – water innovation pipeline, fostering matchmaking between problem owners and solution providers to ensure water security for all in the long term".

Water4All should propose a portfolio of multi-national, multi-faceted and cross-sectoral approaches, encompassing policy, environmental, economic, technological and societal considerations to enable water security for all in the long term. It should therefore be implemented through a joint programme of activities ranging from research and innovation programme coordination to new knowledge and innovation development, transfer to policy-making, operational implementation and

demonstration of the efficiency of solutions. It should be structured according to the following pillars:

- Identify research and innovation priorities to strengthen alignment of EU and national RDI programmes and increase the impact and policy relevance.
- Develop new knowledge and innovative solutions for a systemic and inclusive approach to water challenges at operational scale (e.g. river basin, water catchment).
- Transfer knowledge and innovation to i) policy-makers and ii) operators / managers so that they are able to implement the proposed solutions.
- Demonstrate the efficiency and the sustainability of the proposed solutions at local level, in close cooperation with the relevant actors (including policy-makers and decision-makers).
- Increase and strengthen international cooperation to develop a critical mass in relation to the global challenges faced.

This will create a continuum from the identification of the challenges to the demonstration of proposed solutions, ensuring a more rapid translation of research and innovation into concrete applications and uptake by relevant managers and citizens.

Water4All should rely on a core group composed of R&I programme owners and funders from ministries in charge of R&I policy and agencies, policy makers from ministries in charge of environmental policy and environmental / water protection agencies, from the EU, neighbouring countries and beyond the EU, as core members, in close cooperation with a wide range of other research and economic actors (multinational corporations, suppliers & SMEs, research & technology developers, water utilities, civil society organisations). Partners are expected to provide financial and/or in-kind contributions for the governance structure, the joint calls, and other additional activities. To achieve the international cooperation objectives, collaboration with non-European countries is strongly encouraged.

The partnership is open to all EU Member States, as well as to countries associated to Horizon Europe and will remain open to such countries wanting to join.

To ensure the coherence and complementarity of activities, and to leverage knowledge investment possibilities, the partnership is expected to foster close cooperation and synergies with other ongoing EU and nationally funded R&I activities, the Horizon Missions on Healthy Soils; on Ocean, seas and waters; on Climate Adaptation and on Cities, relevant Horizon Europe partnerships (Chemical Risk Assessment, Driving Urban Transition, Waterborne, Biodiversity, Blue Economy, Safe and Sustainable Food System, Agro-ecology living labs) and other programmes/initiatives (such as Cohesion Policy funds, LIFE programme, COST actions, Development and International Cooperation funds, ESA/Copernicus, KIC Climate, PRIMA, follow-up of BONUS). Proposers are expected to describe in details the way to implement such collaborations.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joints call for transnational proposals resulting in grants to third parties.

The Commission envisages to include new actions in future work programme(s) to continue providing support to the partnership for the duration of Horizon Europe.

HORIZON-CL6-2021-CLIMATE-01-04: Demonstration network on climate-smart farming – linking pilot farms

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 23.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 23.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: The conservation and enhancement of Earth's natural terrestrial carbon sinks such as soils and plants, forests, farmed lands and wetlands is crucial. The European Green Deal gives research and innovation (R&I) a significant role to play in supporting the design and implementation of policies that will ensure the achievement of the EU's climate objectives. Project implementation is expected to contribute to mitigation and adaptation to climate change and help achieve climate neutrality by 2050.

Project results are expected to contribute to all the following expected outcomes:

- Expand the knowledge base of climate related practices, resulting in increased application of climate neutral farming approaches, assessing and evaluating different methods with all relevant actors involved;

- Speed up involvement and adoption by farmers of innovative / smart farming practices that mitigate emissions of greenhouse gases (GHGs) and that foster adaptation of the sector to climate change. In the long term, this will support a more substantial contribution of the farming sector to mitigation of GHG emissions and to carbon storage;

- Increased involvement of Member States' and Associated Countries agricultural knowledge and innovation system (AKIS) in climate-related farming issues, including through linking to the European innovation partnership "agricultural productivity and sustainability" (EIP-AGRI) national / regional / local projects and to advisors, with a view to wider dissemination and interaction within the Member States.

Scope: A wide adoption of practices contributing to mitigation of climate change and carbon storage by farmers is a priority to ensure that the EU reaches GHG mitigation objectives by 2030 and climate neutrality by 2050. Farming is also vulnerable to impacts of climate change; hence adaptation is of utmost importance. Mainstreaming the use of climate-smart practices has been recognised as a priority at the global level, including at the G-20. In particular, the engagement of farmers in this

effort needs to be increased. Therefore, a strong involvement of Member States' AKIS is needed, as well as the development of targeted advice to farmers on climate issues.

The aim is to establish a three level network in a phased manner over Cluster 6 work programmes 2021/2022 and 2023/2024. The first level is a network which will engage front-runner farmers introducing on-farm trials and demonstration of innovations, using existing knowledge both in the EU and Associated Countries. The second level is a network to connect to all advisors on the subject in the Member States, building on achievements of Horizon 2020 projects and EIP-AGRI operational groups and the development of Member States' AKIS, to ensure the provision of targeted advice. The third level of the network will engage and strengthen the capacity of experimental research stations on climate issues.

The present topic deals with the level of commercial farms. This level will engage commercial farms led by sustainability-oriented farmers who are eager to pilot existing or new ready-for-practice techniques and demonstrate them to other farmers. The second level will aim at sharing broadly climate neutral ready-for-practice solutions through a collaborative innovation ecosystem, involving all advisors and the main AKIS actors and AKIS coordination bodies in Member States. The second level will be implemented through Topic HORIZON-CL6-2022-CLIMATE-01-03 "Demonstration network on climate-smart farming – boosting the role of advisory services".

Proposals should:

- Network existing nationally or regionally funded trial farms, including those linked to universities and research institutes, and other farms not yet part of networks;
- Exploit existing and develop new solutions through practice oriented on-farm testing and demonstration in a co-creative approach with the pilot farmers and their advisors;
- Collect and compare tool-kits for assessing GHG balances at farm level, performance monitoring, decision tools, climate services, etc. for possible use on average farms;
- Support the implementation of the EU carbon farming manual as foreseen in the farm to fork strategy and the implementation of the third party certification of carbon removals, as foreseen in the circular economy action plan;
- Foster knowledge exchange within and among Member States and regions and establish links with the EIP-AGRI and Member States' AKIS networks and coordination bodies;
- Link the demonstration farms into an EU demonstration farm network including all Member States to stimulate effective cross-fertilisation among Member States. Include a sufficient number of farmers and their advisors per country, taking into account the size of the Member State and ensuring a broad EU coverage;
- Proposals should include a task to collaborate with project of topic HORIZON-CL6-2022-CLIMATE-01-03 "Demonstration network on climate-smart farming – boosting the role of advisory services" and a topic to be published in Cluster 6 work programme 2023/2024;
- The project should operate for at least seven years and build on the outcomes of the climate-related projects from various funding sources. The project must implement the multi-actor approach and may involve social innovation.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-CLIMATE-01-05: Agroecological approaches for climate change mitigation, resilient agricultural production and enhanced biodiversity

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part. If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal should contribute to the European Green Deal and international objectives to foster climate change mitigation and adaptation in agriculture. It should in particular support the farm to fork's strategy objective of a transition to a fair, healthy and resilient European agriculture, notably its objective to promote agroecology, by unfolding its potential as a farming system based on the sustainable management of natural resources. Activities should improve the knowledge base to inform decision-makers and other relevant stakeholders on how agroecology can contribute to these objectives, while remaining a profitable activity for farmers.

Project results are expected to contribute to all of the following expected outcomes:

- Increased and robust evidence of the potential of agroecology for climate change (mitigation and adaptation), its climate neutrality potential, impact on biodiversity, and the potential for improving farm socio-economic resilience. This should be achieved through quantitative and qualitative assessments allowing to identify and monitor the implementation and performance of optimal combinations of agroecological practices and strategies, as well as trade-offs or gains, barriers and drivers, for different crops and systems representative of the diversity of EU and Associated Countries farming, and at the farm and landscape level;

- Qualitative and quantitative data availability of the social, economic and environmental sustainability and performance of agroecological strategies, contributing to a dependable and transparent knowledge base for EU policy design and implementation (common agricultural

policy (CAP), European Green Deal, objectives of the farm to fork and biodiversity strategies, etc.);

- Increased understanding, adoption and implementation of agroecological practices by farmers;
- Improved understanding of the definition of agroecology and of its application to EU and Associated Countries farming.

Scope: Achieving sustainable agricultural production that fosters both climate change mitigation and adaptation of agriculture to climate change is a policy objective that implies finding a balance with productivity and wider sustainability goals, such as preserving and enhancing biodiversity. Agroecology[115] can provide an important contribution to achieving these objectives, while at the same time enhancing food and nutrition security, thus contributing to achieving the objectives of the farm to fork and biodiversity strategies and the Sustainable Development Goals. Agroecology is a holistic approach that relies on and maximises the use of ecological processes to support agricultural production. By working more with nature and ecosystem services, agroecology has the potential to increase the circularity, diversification and autonomy of farms, and drive a full transformation of farming systems, from input substitution and beyond. The effectiveness of agroecology is context-specific and practices need to be implemented on a significant proportion of farms to deliver tangible impacts on sustainability. Specific methods and indicators are needed to monitor and quantify the positive effects of these practices on climate change mitigation and adaptation at the farm and landscape levels, along with its impacts on yield stability, farm viability and biodiversity, for different farming systems and pedo-climatic conditions. Moreover, improving farmers' uptake of agroecological practices calls for specific support measures and for the design of specific business cases at the farm and landscape levels.

Activities should improve knowledge of the contribution of agroecological practices to climate change mitigation, increased adaptation of farming to climate change, and preservation and enhancement of biodiversity, while ensuring farm profitability, thus providing an important contribution to policy design. Proposals should cover the wide range of crops and farming systems present in the EU and Associated Countries agricultural sector, from conventional to organic. Proposals must implement the 'multi-actor approach', and ensure adequate involvement of the farming sector. Projects funded under this topic should build on the results of relevant projects funded under Horizon 2020 and should ensure collaboration with projects funded under calls *HORIZON-CL6-2022-FARM2FORK-02-01-two-stage: Agroecological approaches for sustainable weed management* and *HORIZON-CL6-2021-FARM2FORK-01-03: Digitalisation as an enabler of agroecological farming systems* in this work programme.

Proposals should identify, evaluate and deliver a method that allows identification of the optimal combinations of agroecological practices and the most suitable agroecological strategies that efficiently contribute to climate change mitigation and adaptation while ensuring biodiversity preservation or enhancement and overall farm profitability. Proposals should improve existing indicators and develop new ones where relevant, to monitor and measure the qualitative and quantitative impacts of these strategies, including their climate neutrality potential and trade-offs or gains in biodiversity, and the associated improvement in farm socio-economic resilience. Proposals should develop tools to identify and monitor both the implementation of agroecological practices in farm management and the full-farm agroecological approaches, analysing the scale-dependent effects from farm to landscape level, as well as the opportunities and challenges derived from

115 http://www.fao.org/3/i9037en/i9037en.pdf

regulation and market aspects. Proposals should develop and test innovative mechanisms to accompany farmers in implementing and/or switching to agroecological practices that contribute to mitigating climate change and other negative environmental impacts. Proposals should undertake an analysis of the social, environmental and economic sustainability performance of such strategies and analyse the potential to integrate such practices in business cases at farm level, including exploring the potential of labelling of products linked to agroecological practices in support of and complying with the current relevant legal framework and, where the scope of activities would cover the food system, the future EU framework for food sustainability labelling to promote and scale-up their uptake.

This topic requires the effective contribution of SSH disciplines.

HORIZON-CL6-2021-CLIMATE-01-06: Resilient livestock farming systems under climate change

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: A successful proposal will contribute to the European Green Deal and international objectives to foster climate change mitigation, pollution prevention and control, and adaptation in agriculture. It will in particular support the farm to fork strategy objective for a transition to a fair, healthy and resilient European agriculture. It will contribute to climate action on land and more specifically towards climate neutrality by reducing greenhouse gas (GHG) emissions and enhancing natural carbon sinks: better understanding and mobilising the mitigation and adaptation potential of livestock farming and related sectors based on the sustainable management of natural resources.

The following outcomes are expected:

- Enhanced adoption by farmers and other relevant actors of innovations that increase the mitigation and adaptation capacity of livestock farming systems to climate change, at animal, population and farm level, therefore improving the resilience of production systems as well as animal health and welfare.

- Improved capacity to assess the environmental and socio-economic impact of mitigation and adaptation practices and options at different scales, alone and in combination.

- Consolidated transition towards a resilient livestock production with novel integrated approaches (in terms of management, breeding, feeding, local resources use, etc.) defined for different climate change scenarios.

Scope: Terrestrial livestock production is considered a large contributor to anthropogenic GHG emissions worldwide and emissions of pollutants to air and water. Although emission intensity in Europe is lower in comparison to many other regions of the world, options to better assess and improve the emissions balance of terrestrial livestock production, weather intensive or extensive/low input, including organic, are necessary, including the evaluation of appropriate indicators of GHG emissions in different breeds, environments and production systems, in order not to rely solely on a reduction of the demand in food of animal origin to improve the emission balance of the sector. A variety of options have been identified, but are not yet common practice, and the potential of breeding to contribute to an improved GHG balance was not much investigated so far. In addition, the likelihood of further climate change occurring, and the increasing scale of potential climate impacts require addressing agricultural adaptation of the livestock sector as well.

The proposals should investigate at different levels (animal, herd, farm and sector, region) and with a coherent approach, practices and innovations that enable a reduction of the net GHG emissions by terrestrial livestock, while striving to ensure farm viability and resilience of productions systems, including adaption to climate change, and taking into account the impact on the environment and biodiversity. Trade-offs within and between the different levels should be addressed. At animal level, the research should use systems biology to study interactions between host and environment (e.g. feed and microbes) and how this interplay affects the efficiency of feed utilisation (energy and proteins) and GHG emissions, not least methane. Proposals should define and investigate traits/phenotypes, and the potential of breeding, to reduce GHG animal emissions or/and adapt to climate change. At farm level, different husbandry practices should be addressed. At sector/regional level, a system approach should investigate how different actors can cooperate to improve the GHG balance of livestock production, optimising the use of resources, including feed (e.g. production and origin), improving circularity. In addition to biophysical research, the proposals should address the potential socio-economic impact of the proposed practices and innovations, and look at options to facilitate their uptake. Proposals should develop or refine related tools for a proper assessment of practices and proposed innovations. Proposals should take into account novel farming systems and future scenarios, different breeds, particularly local breeds, various management approaches, climatic conditions and regional specificities. Proposals should address at least cattle and pigs and may address any other relevant species.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement. Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector, terrestrial livestock breeders, advisers and other relevant actors.

The proposals should take into account other EU-funded projects, including those funded under the ERA-NETs SusAn[116] and ERA-GAS[117].

HORIZON-CL6-2021-CLIMATE-01-07: International Research Consortium on (agricultural) soil carbon

116 https://era-susan.eu/

117 https://www.eragas.eu/en/

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding. Legal entities established in non-associated third countries may exceptionally participate in this Coordination and support action.

Expected Outcome: Activities should contribute to all of the following expected outcomes:

- establishment of an International Research Consortium (IRC) on soil carbon and related issues;
- creation of a knowledge platform for sharing information on relevant research activities and results concerning methodologies for soil carbon balance monitoring, and practices for increasing soil carbon (e.g. carbon farming);
- better coordination of research activities and of methods for monitoring soil carbon stock changes at global level, thereby maximising complementarities and avoiding duplication of efforts;
- validated methods to support national greenhouse gas (GHG) inventories;
- increased transparency with regard to progress towards commitments on soil carbon under the Paris Agreement on Climate Change.

On the long(er) term, activities will contribute to meeting international commitments concerning carbon sinks (Paris agreement), as well as to the European Green Deal overall objective to become the world's first climate neutral continent by 2050.

Scope: Soil health is threatened both in Europe and globally by the effects of human activities and climate change. It is estimated that between one fourth and one third of global soils suffer from degradation. Soil degradation negatively impacts on food production, biodiversity or soil's capacity to retain water and store carbon. Urgent action is needed to stabilise and increase soil carbon in soils, thereby also drawing down atmospheric CO_2 and monitor its status in more reliable ways, at a range of scales from field to region and at a low cost. Yet, knowledge and methodological gaps exist in relation to measuring soil carbon stocks and changes in soil carbon as well as with regard to effective measures for increasing soil carbon. Furthermore, research and innovation (R&I) efforts are dispersed and results not widely known or taken up.

International research cooperation is needed to pool resources and scale up efforts for monitoring soil carbon stock changes, remote sensing and modelling. Activities should include

- building a formal research cooperation between EU and international partners on soil carbon. While initially focusing on carbon in agricultural soils, the partnership should progressively expand during the lifetime of the project to address also other land uses (e.g. forests, pastures, public areas for recreation including in urban settings);
- an analysis of results of on-going R&I and knowledge sharing through a single online knowledge platform with access to information and data from different existing repositories;
- building a roadmap for R&I priorities at international level based on identified knowledge gaps as well as identifying and developing joint flagship initiatives;
- establishing the methodological basis for a harmonised monitoring and verification of soil organic carbon balance.

For activities involving satellite-based earth observation, positioning, navigation and/or related timing, the selected project should use as much as possible Copernicus and/or Galileo / EGNOS (taking into account possible limitations on their use by international partners). Other data and services may be used additionally.

Activities should be implemented in synergy with major soil related European initiatives including the European Joint Programme EJP Soil and a planned mission in the area of Soil Health and Food.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Destination 6 – Resilient, inclusive, healthy and green rural, coastal and urban communities

HORIZON-CL6-2021-COMMUNITIES-01-01: Grasping rural diversity and strengthening evidence for tailored policies enhancing the contribution of rural communities to ecological, digital and social transitions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 7.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

	If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The following additional eligibility criteria apply: Proposals focusing on one type of activity or sector (e.g. primary production) are out of scope. The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European Green Deal[118], in particular its fair and just transition component, the European digital strategy[119], the European pillar of social rights[120] and the EU long-term vision for rural areas[121]. It will do so by improving the understanding of the environmental, socio-economic, behavioural, cultural and demographic drivers of change in rural areas. Stronger evidence on which to build their strategies and initiatives will empower rural people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Projects results are expected to contribute to all of the following expected outcomes:

- more evidence-based, place-based, integrated and tailored policies, strategies and governance frameworks at local, regional, national and EU levels to drive the sustainable transition of rural areas and communities, building on the specific outcomes below;

- a refined understanding by policy-makers and rural actors of the diversity of rural situations, and of the challenges and opportunities associated with megatrends, potential major shocks and upcoming transitions, in particular climate, environmental and social challenges, to tailor policy interventions to local realities;

- a refined understanding by policy-makers and rural actors of functional characteristics of territories, functional relations between rural places and other rural and/or urban places within a territorial continuum and the importance of these relations for sustainable development, to design synergistic approaches favouring a networked and interlinked development; and

118 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

119 https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

120 https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

121 https://ec.europa.eu/info/strategy/priorities-2019-2024/new-push-european-democracy/long-term-vision-rural-areas_en

- a refined assessment by policy-makers of the impact of all current and upcoming policies on rural communities (rural proofing[122]), including sectoral or thematic policies (such as climate, energy, mobility, digitalisation, health and social inclusion), or policy frameworks designed to accompany sustainability transitions in general, to tailor interventions to maximise possibilities for rural communities to contribute to and benefit from these transitions.

Scope: The EU aims to lead just digital, economic and ecological transitions that will leave no one behind. Close to one third of EU citizens live in rural areas, which represent 83% of the EU territory and supply the whole of society with essential goods and services. These broad figures hide a variety of situations, challenges and opportunities regarding the aforementioned transitions that the current evidence base insufficiently captures.

The design of positive governance frameworks and policy interventions for rural communities is hampered by i) the lack of conceptual frameworks that properly grasp the role of rural areas and communities in sustainable development and sustainability transitions; ii) a lack of data on several aspects at the right geographic scale, in particular on climate and environment performance and on social challenges, quality of life and well-being. The lack of data at the right geographical scale (local in many cases) is hampered by the technical and economic difficulties of finer data collection.

Proposals should explore innovative and out-of-the box ways to describe and characterise rural areas or various forms or degrees of rurality in multi-dimensional ways, screening a wide range of possible (including new) data sources going beyond conventional indicators such as population density and settlement configuration. They should analyse national and other definitions and approaches and engage with stakeholders to understand their perspectives on rurality. Proposals should define and describe functional linkages between various localities and territories and explore and develop ways to apply functional geography approaches to rural areas (e.g. developing the concept of functional rural area), learning from past work[123] and failures on such approaches. Trade-offs in selected approaches should be analysed in regional and national contexts highlighting geographical differences.

Proposals should screen and benchmark the performance and cost efficiency (infrastructure needs, ease and frequency of updates etc.) of data collection methods and technologies including new ones (e.g. digital technologies, geolocation and geospatial techniques, crowd sourcing, citizen science) that could be used to collect the necessary rural data at the local level across a majority of EU Member States and Associated Countries in Europe, at affordable costs and select viable options for testing these options. They should strengthen rural evidence and rural data collection, documentation and access, in particular in the environmental, climate and social fields by generating data and designing, testing and implementing methods to:

- calculate climate and environmental indicators for rural communities, including rural dwellers and secondary-homers;

- upgrade socio-economic (including culture) assessment, analysis, monitoring and evaluation tools (stats, indicators, including the measurement of well-being, quality of life and attractiveness including gender and age differences);

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122 See Point 1 'Promoting rural prosperity' of the Cork 2.0 Declaration (2016)

123 Such as ROBUST (https://cordis.europa.eu/project/id/727988) and COASTAL (https://cordis.europa.eu/project/id/773782) under Horizon 2020 and projects funded under the ESPON programme https://www.espon.eu.

- assess resilience to major threats, with particular emphasis on resilience and vulnerability factors under the COVID-19 pandemic.

This should result in enriched, upgraded and regularly updated platforms, data and indicators mapping, describing and monitoring economic (including sectors, jobs and income), social (including quality of life and well-being) and environmental (including climate mitigation and adaptation and energy) characteristics of rural areas and communities at sub-regional, local or functional levels, contributing to relevant actions of the long-term vision for rural areas in this domain. The analysis carried out should help to grasp the diversity and specificity of rural places in the EU and Associated Countries, their inter-relations, their preparedness for transitions, major shocks and megatrends, their capacity to take advantage of these trends in adaptive and resilient ways.

Proposals should benchmark climate and environmental policies and existing frameworks to describe and measure well-being, quality of life and attractiveness, assess their relevance for rural areas and communities and make recommendations for adapting these frameworks. They should in particular propose innovative schemes to reach climate neutrality by 2050 while taking advantage of the ecological transition and preserving ecosystems (nature-based solutions), landscapes etc. Finally, they should support rural proofing[124] by developing tools completing those already existing on territorial impacts (e.g. under the EU Better Regulation[125]), to assess the impact of EU policies and programmes on rural areas and communities.

Proposals must implement the multi-actor approach, bringing together from the start multiple types of scientific expertise in both hard sciences (e.g. climate, energy, and environment) and social sciences and humanities (e.g. geography, sociology, behavioural sciences, policy, foresight) together with a variety of rural community representatives. This topic should involve the effective contribution of SSH disciplines. Projects outputs should be scalable at least to the EU as a whole, hence they should be developed using data from a representative diversity of rural contexts across the EU. Proposals should strengthen evidence on rural areas and communities in a multi-dimensional way (proposals focused on one particular sector -e.g. primary production- or dimension of sustainability would not be considered as addressing the challenge appropriately). Proposals should engage with both national authorities and rural communities on their understanding of rurality and on project developments. Proposals should foresee a task to work jointly with other projects funded under this topic and with the European Commission, its common agricultural policy[126] networks[127] and other relevant networks (e.g.: future Farm Sustainability Data Network (FSDN)[128]) and projects (including research projects[129]) contributing to building rural evidence.

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124 Rural proofing means to 'systematically review other macro and sectoral policies through a rural lens, considering potential and actual impacts and implications on rural jobs and growth and development prospects, social well-being, and the environmental quality of rural areas and communities', Cork 2.0 Declaration, A better life in rural areas.

125 Better regulation tool #33 on territorial impacts: https://ec.europa.eu/info/files/better-regulation-toolbox-33_en

126 https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy_en

127 Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

128 Commission Communication 'A farm to fork strategy' (in particular section 3.2) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381

129 https://ec.europa.eu/info/research-and-innovation/research-area/agriculture-and-forestry/rural-and-farming-dynamics-and-policies_en; projects funded under HORIZON-CL6-2021-GOVERNANCE-01-13 "Modelling land use and land management in the context of climate change"

The possible participation of the JRC in the project will consist of connecting project activities to on-going work on integrated territorial strategies and or various domains mentioned in the topic to ensure complementarities and synergies, in particular advising on the data collection methods to be tested and on filling-in data gaps at high spatial granularity (NUTS3, LAU or grid levels). The contribution is framed on the context of the Knowledge Centre for Territorial Policies.

HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Due to the scope of this topic, legal entities established in all member states of the African Union are exceptionally eligible for Union funding. The following additional eligibility criteria apply: Proposals focusing on one type of activity or sector (e.g. primary production) are out of scope. Legal entities established in non-associated third countries may exceptionally participate in this Coordination and support action. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: The successful proposal will contribute to fostering a sustainable, balanced and inclusive development of rural areas, supporting the implementation of the European Green Deal[130], in particular its fair and just transition component, the European digital strategy[131], the European pillar of social rights[132] and the EU long-term vision for rural areas[133]. It will do so by accelerating the deployment of digital, nature-based, social and community-led innovations in rural areas through capacity building and enhanced knowledge exchange, leading to rural communities that will be better equipped with innovative and smarter solutions that increase access to services, opportunities and adequate innovation ecosystems. Enhanced capacities and better knowledge flows and

130 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

131 https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

132 https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

133 https://ec.europa.eu/info/strategy/priorities-2019-2024/new-push-european-democracy/long-term-vision-rural-areas_en

innovation support will empower rural people to act for change and get prepared to achieve climate neutrality by 2050, adapt to climate change, and turn digital and ecological transitions into increased resilience, good health and positive long-term prospects, including jobs, for all including women, young people and vulnerable groups.

Project results are expected to contribute to all of the following expected outcomes:

- enhanced capacity of rural communities and rural people to innovate for change thanks to the specific outcomes below;
- improved skills and knowledge of rural citizens, entrepreneurs, organisations, local action groups[134] and community leaders of existing tools to develop and implement rural innovation (including social innovation) strategies and innovative actions to implement these strategies in rural communities, in all domains of relevance to rural life and economy;
- shortening of the innovation cycle in rural communities and businesses leading to quicker results and transitions in rural communities, strengthened human capital, including more lively networks and improved attractiveness of rural communities, in particular for women and young people;
- enhanced valorisation by rural communities of the results of rural innovation projects funded under various programmes; and
- enhanced dialogue and cooperation on rural innovation worldwide, with sharing of learning resources.

Scope: Proposals should provide capacity building on rural innovation towards rural communities and actors in the EU and beyond, seeking to valorise the outcomes of projects funded under various programmes. The latter may include Horizon 2020, Horizon Europe, the common agricultural policy (LEADER, EIP-AGRI operational groups), regional policy (community-led local development, INTERREG, smart specialisation strategies), preparatory actions such as the Smart rural project[135] or SMARTA[136] and other EU or non-EU relevant actions. Projects from these programmes should be considered as relevant if they produced practical tools to develop and/or implement strategies and roadmaps in various domains (energy, digital, climate adaptation and mitigation, mobility, environment, social, education and care, food etc.), innovation approaches such as living labs, activities related to smart villages; training packages, videos etc. innovation activities in general and innovative solutions. Proposals should pay special attention to social innovation[137], which has been demonstrated to have a high potential to meet rural challenges. Social innovation is recommended when the solution is at the interface between social and technical solutions and requires social change, new social practices, social ownership or market uptake. Capacity building should target in particular communities developing smart village strategies[138] as foreseen under the common agricultural policy for 2021-2027[139] or similar initiatives, paying attention to the needs of various groups within these communities (e.g. women, youth etc.). They should map and promote funding opportunities and prepare the ground for rural communities to take part in innovation actions

134 https://enrd.ec.europa.eu/leader-clld/lag-database_en

135 https://www.smartrural21.eu/

136 https://ruralsharedmobility.eu/

137 Social innovation is defined for this topic as "*the reconfiguring of social practices, in response to societal challenges, which seeks to enhance outcomes on societal well-being and necessarily includes the engagement of civil society actors*". (SIMRA)

138 https://enrd.ec.europa.eu/enrd-thematic-work/smart-and-competitive-rural-areas/smart-villages_en

139 https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

funded under Horizon Europe or other innovation support actions that can be used to support ecological, digital or social transitions in rural areas (whether or not they are targeted to these areas).

Proposals should organise the capitalisation and exchange of knowledge between projects funded under Horizon Europe working on innovation for rural communities. They should feed in and translate results from the research and innovation actions as these results become available. They should allow the portfolio of projects to reflect on rural innovation processes, lessons learnt and ways to improve innovation processes and innovation systems for rural communities in a multi-dimensional and multi-sectoral way. They should also ensure a lively interface between actions supporting rural community-led innovation funded under Horizon Europe (e.g. HORIZON-CL6-2022-COMMUNITIES-01-01 and HORIZON-CL6-2022-COMMUNITIES-02-01-two-stage in the work programme 2021-2022) and common agricultural policy networks[140]. The project duration should be adapted to ensure such capitalisation is possible (a duration of at least five years is recommended). They may engage in collaboration with projects funded under other relevant calls[141].

Proposals should explore with rural communities and benchmark various options and business models to create viable, networked and long-term rural innovation expertise and training mechanisms, centre(s) or hub(s) in Europe, able to capitalise on new knowledge and tools created and process them into training packages and sessions for rural communities in Europe and beyond. They should engage with international partners, including relevant international organisations (e.g. FAO, OECD) and partners in priority regions of the world for EU international cooperation on rural development (e.g. Africa) or with outstanding expertise in rural development, on resources to support the sustainable development of rural communities. Proposals may include partners from these countries in capacity building activities.

Proposals must implement the multi-actor approach, bringing together the required competencies in communication, dissemination, exploitation and training alongside genuine knowledge of rural communities' context. Training contents and packages should be provided in multiple languages and multimedia formats allowing their wide dissemination in the EU and beyond. They should be developed, tested and validated taking into account the specific needs of various types of rural actors (including women, young people, entrepreneurs, community-leaders, elderly etc.) in various types of rural areas (e.g. close to cities, remote etc.) and cover a wide variety of important aspects of rural life that rural communities may want to innovate on (e.g. energy, mobility, education, services, health, climate, environment etc.). Proposals focusing on one type of activity or sector (e.g. primary production) would not be considered as addressing the challenge appropriately. Synergies may be developed with other actions targeting community-based innovations in specific domains, innovation support or education and training.

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140 Currently ENRD and EIP-AGRI (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#enrd) to be replaced by the networks to be funded under the future CAP: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en

141 e.g. HORIZON-CL6-2021-GOVERNANCE-01-26 'Deepening the functioning of innovation support', HORIZON-CL6-2021-CIRCBIO-01-08 'Mainstreaming inclusive small-scale bio-based solutions in European rural areas'; HORIZON-CL6-2021-GOVERNANCE-01-09 'Revitalisation of European local communities with innovative bio-based business models and social innovation' etc.

HORIZON-CL6-2021-COMMUNITIES-01-05: Integrated urban food system policies – how cities and towns can transform food systems for co-benefits

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Proposals focusing on one type of activity or sector (e.g. primary production) are out of scope. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities and the farm to fork strategy for a fair healthy and environmentally friendly food system, as well as of the EU's Climate ambition for 2030 and 2050, the successful proposal will support the development of policies, business models and market conditions contributing to the sustainable, balanced and inclusive development of urban and peri-urban areas and to the empowerment and resilience of their communities, who can access, afford and choose healthier, nutritious and environmental-friendly food.

Project results are expected to contribute to all of the following expected outcomes:

- City-region food systems and of the urban-rural linkages across Europe are better understood and taken into account in urban policies;
- The concept of local food environments is better understood and taken into account in local planning, with a view to driving people towards healthier food choices and transforming urban food systems to be healthier, circular and resilient;
- More cities and towns build on good practice initiatives (e.g.: signatory cities of the Milan Urban Food Policy Pact) to develop integrated urban food policies and planning frameworks linking health, environment and food systems, bridging the national and the local level and including risk prevention and reduction plans to anticipate and manage food systems shocks, as well as to develop resilience;
- Strengthened urban food systems governance through increased multi-stakeholder engagement in designing and implementing urban food policies in cities and towns across Europe, representing different cultural and geographical settings;

- More Higher Education Institutes engaging in structured and long-term collaborations with local/regional actors to help transform their urban food system through participatory R&I;

- Improved decision-making by government actors willing to commit to change their local food systems, based on ready-to-use knowledge on the typologies, evolution, outcomes and impacts of integrated local food policies, throughout and within Europe, and in comparison with other regions.

Scope: Urban areas face a serious challenge to ensure healthy, affordable, safe and sustainably produced food to their residents. Many cities and their inhabitants are disconnected from their food – e.g. where it comes from, how it is produced, the impact food production and consumption have on the environment, climate and health, and the complexity and fragility of food value chains –. The way in which cities deal with food is highly variable and often fragmented, but integrated urban food policies and social innovations providing co-benefits are progressively emerging throughout Europe.

A key issue to be addressed is that of poorly planned urban food environments that drive citizens, and children in particular, towards unhealthy packaged food that is high in calories, sugars, salt and saturated fat, which contributes to obesity and diet-related illnesses. Furthermore, different shocks disrupting urban food systems worldwide can exacerbate the already limited access to healthy food, in particular for the urban poor.

Cities have the potential to make healthy and sustainable food available, affordable and attractive to all, which will in turn reduce consumption-based GHG emissions, in a win-win situation for people and the planet.

Proposals under this topic should address the following four issues and be targeted to help at least 5 cities/towns lacking integrated food systems policies to take ambitious and decisive action:

a. Understanding: map local food systems, policies and actions, with a special focus on assessing short supply chains and urban food environments (including harmful marketing and advertising and unequal access to healthy food for the urban poor), and on developing local indicators and monitoring frameworks.
   This should be built on existing tools such as the "Food systems dashboard framework" and should include the development of food systems stakeholder maps, maps of the formal and informal food flows and retail channels and, especially relevant in case of food shock crisis, maps identifying the most vulnerable people and their access to nutritious food.
   This should include analysing the local responses to emergencies and take into account the environmental, social and economic dimension.

b. Governance: develop and evaluate innovative, multi-actor, urban food systems governance processes and capacities for science-backed integrated policy making and implementation actions that deliver on farm to fork strategy objectives and Food 2030 co-benefits for health, environment, climate, circularity and inclusion, while minimizing trade-offs. Special attention should be given to improving food environments, providing increased food access to vulnerable groups and fostering short supply chains.

c. Engaging: mobilise a wide diversity of food system actors from farm to fork (i.e. public and private, the financial sector, civil society and academia). Higher education institutions and research centres, in particular, should be engaged to collaboration with local actors to support

evidence-based food policy development and to help provide local solutions to integrated food system challenges.

d. Mutual learning: reinforce or create new networks of cities and towns to share good practices and learn from and support each other. This implies involving cities with well-developed food policies to provide guidance and lessons learned, as well as new forms of collaboration/twinning.

Proposals should address inequalities in urban food systems, whether they be due to gender, race and other social categories.

Conducting inter and trans-disciplinary research and involving a wide diversity of food system actors is required to implement the multi actor approach (cf eligibility condition). In particular, a strong involvement of citizens and civil society, together with urban designers, design thinkers, social innovators, planners, social scientists and public authorities to strengthen relationships between urban planning and food choices and to develop new methods and approaches to innovation have to be ensured.

Proposals should set out a clear plan on how it will collaborate with other projects selected under this and any other relevant topic/call, e.g. by participating in joint activities, workshops, as well as common communication and dissemination activities.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

This topic should involve the effective contribution of SSH disciplines.

Destination 7 – Innovative governance, environmental observations and digital solutions in support of the Green Deal

HORIZON-CL6-2021-GOVERNANCE-01-02: Furthering food systems science and federating researchers across the European Research Area

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 17.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

	The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio, grants will be awarded to applications not only in order of ranking but at least also to one project within Action a) that is the highest ranked, one project highest ranked within Action b) and one project highest ranked within Action c), provided that the applications attain all thresholds.

Expected Outcome: The selected project results are expected to contribute to the following outcomes:

- New game changers to provide sustainable diets and nutrition for all, ways to meet the Green Deal targets, establish cross cutting priorities, establish knowledge as a legitimate player/enabler in public debate, accelerate scientific progress, redesign farming systems, cope with unforeseen system shocks, and develop smart diversification.
- A food systems transformation, which achieves co-benefits for nutrition and health, climate mitigation and adaptation, environment, biodiversity, circularity, inclusion and overall sustainability.
- Novel understanding on how, and to which degree, such a transformation can be catalysed and sustained in the long term, and how the resulting trade-offs can be mitigated.
- Knowledge and understanding of how to move towards true cost accounting of food and food systems services that adequately integrate social and environmental externalities and embed environmental accounting (e.g. LCA).
- New insights, methods and tools to assess and manage the full systemic complexity of food systems and their multiple drivers, their dynamics and the issues and opportunities that relate to them.
- Ways to measure food system performance across all three dimensions of sustainability, which can provide more informed decision and policymaking, and implementation.
- An increase in the scientific understanding of food systems, in particular their systemic aspects, as to how they function, and how to transform them for co-benefits and minimised trade-offs.
- Engagement of academia and the necessary practitioners in science, innovation and beyond, that can deliver the necessary scientific methodologies and approaches to support policymakers to put complex transformations into practice.
- The establishment of a broad interdisciplinary network of researchers, scientists, universities and research centres covering a wide diversity of food systems-related disciplines, as well as those dealing with complex systems, to further systems science in this area.
- A strengthened European Research area for food systems transformation for co-benefits

Scope: This topic should support and strengthen the science, and the science-policy interface relevant to food systems, in particular in relation to delivering on farm to fork and Green Deal policy priorities. Successful proposals are expected to address one of the three inter-connected transformation actions:

Action a) Advance food systems science through:

- Mapping of existing food systems and typologies and design of new/existing indicator sets that could be applied at different spatial levels (local to global), with a focus on Europe.
- Development of methods and means to assess food system sustainability, such as establishing an overall food systems sustainability score incorporating common agreed Life Cycle Analysis methodologies.
- Development of innovative cause-effect simulation models that include all food system sectors and actors beyond the economic focus and which can integrate the three pillars of sustainability to explore the potential impact of different food systems transition options and scenarios delivering co-benefits, while minimising trade-offs.
- Providing sound evidence for policy and regulatory science needs to deliver food systems transition towards sustainability; including on how to transition to a true cost of food and food systems services that adequately embed social and environmental externalities relevant to various levels (global to local).

Action b) Contribute to building up a food systems European Research Area – part 1 - through:

- Launching new and assessing ongoing food systems foresight activities (building on existing ones including the fifth SCAR Foresight), detecting emerging trends, and delivering early warnings to policy makers and other relevant actors.
- Establish a project for policy support capacity to extract, summarise and disseminate findings and achievements of relevant EU Horizon projects and clusters of projects to policy makers, food systems actors and the public.
- Perform measurement of, and increase research impact of food system science (for example by assisting scientists to adopt inter and transdisciplinary approaches), and encourage the exchange of scientists for mutual learning and knowledge transfer across disciplines
- Foster citizen science in support of food systems transformation by assessing existing attempts, communicating successes, and catalysing new citizen science initiatives across Europe, in particular by engaging with youth, women, and under-represented communities

Action c) Contribute to building up a food systems European Research Area – part 2 – by creating an interdisciplinary pan-European academic network for food system science that integrates the social sciences and humanities, natural science and engineering, and design. This should:

- Federate universities, academics and researchers across Europe to support and engage in inter and trans-disciplinary research, foster debate, reflexivity and responsible research and innovation (RRI) in support of food systems transition and improved policymaking at all levels from global to local.

- Develop and share freely available open access educational material/curricula to be used by Higher Education Institutes (bachelors and post-graduate levels) to help strengthen their exiting food systems-related teaching and research with an inter and transdisciplinary systems dimension that integrates all three aspects of sustainability, and farm to fork policy and Green Deal priorities.

- Support researcher training, mobility, mutual learning and knowledge sharing, and open science approaches.

- Disseminate and communicate scientific outcomes adapted for multiple audiences including researchers, policy makers, industry, science media and society. This will also include the organisation of a major international annual/bi-annual conference dedicated to advancing food systems science.

- Establish a high-level liaison with EU and relevant international initiatives.

Proposals must involve a wide diversity of food system actors and conducting inter-disciplinary research to implement the required multi actor approach (cf eligibility conditions).

All projects should explain and map how co-benefits should be achieved relevant to the four Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowerment of communities.

All projects should ensure a clustering mechanism with each other and feedback mechanisms with other governance topics and provide general scientific advice for related food systems oriented Horizon Europe projects.

All projects should set out a clear plan on how they should collaborate with other projects selected under this and any other relevant topic/call, by participating in joint activities, workshops, as well as common communication and dissemination activities and channels.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-GOVERNANCE-01-04: Strengthening bioeconomy innovation and deployment across sectors and all governance levels

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

	The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: The successful proposal will contribute to the development of a Strategic Deployment Agenda for the Bioeconomy, including Food Systems, one of the actions in the 2018 bioeconomy strategy and Action Plan. The European bioeconomy strategy and Action Plan[142] aims to deploy innovations across Europe to ensure that the bioeconomy as a whole is a vehicle for inclusive and sustainable growth at the local level, and is a key contributor to EU's Climate ambition for 2030 and 2050. It will contribute to improved governance for innovation ecosystems and enable advances in sustainability and resilience.

Project results are expected to contribute to all following expected outcomes:

- Improved understanding about which measures should be taken, by EU, Member States, and others to strengthen the innovation ecosystem within and across food systems and bio-based sectors, based on a detailed mapping exercise and on a comprehensive view on issues related to deployment

- Improved impact and efficiency of bioeconomy innovation and innovation systems

These outcomes will also support the farm to fork strategy for fair, healthy and environmentally friendly food systems, the EU Green Deal policy priorities and the EU's Climate ambition for 2030 and 2050.

Scope: Innovation today and the initiatives and structures that are part of it at EU, national, regional, and local level already contribute to the uptake and deployment of innovative solutions for example by supporting testing, demonstration, and training, and by investing in the infrastructure that enables these activities. However, more action is needed to (1) address the fragmentation of this innovation ecosystem across food systems and bio-based sectors, (2) to create linkages between the different levels of governance, and (3) to improve the interfacing between the research communities, the innovation communities, investors and citizens. Actions that address these areas of improvement across the bioeconomy are to be preferred because their crosscutting nature and trans-disciplinarity might be a further source of innovation and system transformation, and because they enable sharing of best practices across sectors and actors.

Proposals are expected to:

- Identify instruments and initiatives that contribute to spreading knowledge and deploying innovations in and across food systems and bio-based sectors, at EU, national, regional, and local level. Identify links with other policies (e.g. education) and instruments (e.g. financial instruments, regulation);

- Analyse possible interactions and complementarities between initiatives, instruments and policies;

142 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583773927512&uri=CELEX:52018DC0673

- Identify opportunities for improved governance and for enhanced cooperation between instruments and initiatives within the bioeconomy's innovation ecosystems, across the EU, Member States and private sector;

- Recommend actions to improve bioeconomy innovation and the deployment of new knowledge, technologies and practices, in particular by strengthening cooperation between entities and activities that support different forms of innovation.

Proposals should:

- Map the structures, instruments and initiatives that make up the innovation ecosystem of the bioeconomy with respect to food systems, bio-based sectors (including the blue economy), at local, regional, national and EU level

- Put in place networking and matchmaking activities to allow these structures, instruments and initiatives to raise their profile, to identify opportunities for new collaborations both amongst themselves, and across the different sectors of the bioeconomy

- Provide advisory support to these structures, instruments and initiatives to align themselves to policy priorities at different levels of governance, and in full awareness of existing schemes of sustainability and circularity indicators of the bioeconomy

- Identify best practices to improve the exploitation of outcomes from funded research within innovation communities, innovators and entrepreneurs, and public and private investment communities

- Examine the possibilities for improved reporting on the state-of-play and results of innovation in the bioeconomy

- Address specific barriers to reducing the fragmentation of the innovation ecosystem

- Deliver specific recommendations related to thematic financial instruments and tools applicable to sectors of the bioeconomy and to innovation. Targets of this activity should be previously mapped public and private investors, entrepreneurs and all the structures, institutes, programs and initiatives. Advice should focus on the effective and integrated use of financial tools to support innovation in the long term, and on the contribution to building a sustainable and responsible financing framework in Europe

- Where appropriate, link to Horizon 2020 and Horizon Europe projects that demonstrate innovative and cross-sectoral solutions, as well as to relevant EU initiatives (for example those linked to : European Innovation Partnerships, European Innovation Council, European Institute of Innovation & Technology).

- Engage with policy makers and other stakeholders/initiative-owners that are responsible for innovation support at different levels of governance, to co-create recommendations to improve bioeconomy innovation and the deployment of new knowledge, technologies and practices

Proposals should set out a clear plan on how they foresee to collaborate with other projects selected under this and any other relevant topics/calls, by participating in joint activities, workshops, as well as common communication and dissemination activities.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-GOVERNANCE-01-07: Regional governance models in the bioeconomy

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: Successful proposals will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal', and the European policies it supports, in particular the European Green Deal, and EU bioeconomy strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all of the following expected outcomes:

- Creation of a supporting governance structure and related capacities for regional authorities, contributing to the Circular Cities and Regions Initiative (CCRI)[143] and aiming at developing comprehensive and innovation- and sustainability-driven bioeconomy strategies.

- Support to local economic and implementing authorities, including at bioeconomy clusters' level, to improve engagement of regional and local actors, considering hierarchy of use, trade-offs, synergies, business models, participatory approaches etc. with improved environmental, social and economic impacts.

- Support to the development of regional/local strategies, aiming at exploiting and developing balanced local potentials and innovation (in terms of feedstock, infrastructures (e.g. biorefineries) for logistics, services and production, investments) within the framework of local development and investment as well as environmental protection plans.

- Integration of the opportunities created by the local bio-based economy within broader bioeconomy transition, e.g. by linking ecosystem/nature services' valorisation with sustainable biomass production, processing, product design and manufacture, circular use and upcycling to new applications.

143 https://ec.europa.eu/research/environment/index.cfm?pg=circular

- Development of the best practice guidelines for local operators and innovation developers, supporting climate-neutrality and low environmental footprint improvements of bio-based products and services;

- Development of novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors;

Scope: Improved and informed governance including social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, and reducing the risk of leaving anyone behind. This should take into account the regional and local peculiarities, including feedstock availability, industrial development, consumption patterns, market measures and available investment streams (financial models), while ensuring effective sharing of best practices across European regions. This also helps to advance innovation at local scale and engage all actors.

This action should support the implementation of sustainable bio-based value chains, in regional settings (toolbox of instruments including strategies, plans and programmes, including the social dimension). Proposals should benefit from social creativity and opportunities at regional scale unleashed for bio-based systems, ensuring their low environmental footprint, and providing for its operational verification. Robust environmental protection plans should underpin the effort undertaken.

The local dimension refers to regional scales, in terms of rural/urban/coastal areas, to be identified/defined in their specific characteristics to act as optimal frameworks for coherent and replicable strategies of bio-based systems. The proposals should seek complementarities with related actions[144] on the governance of bio-based innovation and ensure inclusiveness and the engagement of all actors.

Proposals should:

a. Analyse and structure the regional bioeconomy-related policy mix (e.g. regional operational programmes, bioeconomy strategies under the common agricultural policy instruments, innovation action plans, business models, environmental protection plans) to understand the potentials, bottlenecks, and opportunities, capacities etc. for feedstocks, infrastructure, investment, human skills, innovation actors (including community knowledge) etc. to enable sufficient impacts/benefits/positive trade-offs and performances of the specific bioeconomy/bio-based value chains;

b. assess existing/develop a new policy monitoring system and key performance indicators of the effectiveness and robustness of existing governance schemes, to allow replication across Europe (e.g. income generation for all stakeholders, labour conditions, environmental indicators, social engagement, innovation parameters etc);

144 Such as the POWER4BIO and BE-Rural projects funded under Horizon 2020 or the projects under the call SwafS-14-2018-2019-2020: Supporting the development of territorial responsible research and innovation.

c. ensure efficient exchange of best practice and engagement of all actors (regional and local authorities, SMEs, civil society organisations including NGOs, knowledge providers) via robust and transparent communication and awareness-rising campaigns;

d. analyse social and economic barriers and potentialities to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society etc, considering gender and age, where relevant.)

HORIZON-CL6-2021-GOVERNANCE-01-08: Improving understanding of and engagement in bio-based systems with training and skills development

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal', and the European policies it supports, in particular the European Green Deal and EU bioeconomy strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all of the following expected outcomes:

- Creation of guidelines for training and mentoring programmes in specific European regions and local communities, on knowledge and skills useful in the bioeconomy, and in particular bio-based sectors.

- Increased awareness, understanding and engagement of all actors (especially stakeholders involved in adult learning, retraining and skills' development) with focus on co-creation, and social innovation.

- Support to the local balanced local potentials and innovation (in terms of feedstock, infrastructures, capacities) within the framework of local development and investment as well as fostering sustainability-driven policy.

- Integration of the opportunities created by the human-centric principles, offered by art, culture and (eco)-design, in respect to the bio-based feedstocks, including traditional and novel biological materials.

- Support to the feedback loops from the society to the policy makers, by developing the best practice guidelines for local operators and innovation developers, supporting climate-neutrality and low environmental footprint improvements of bio-based products and services;

- Development of skills leading to the novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors.

Scope: Improved and informed governance including social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, and reducing the risk of leaving anyone behind. This should take into account the need to promote social engagement, supporting the permanent learning and re-training, in the area of bio-based economy.

This needs to take into account local specificities, such as the sustainable biological resources available (both traditional materials such as wood, cork or straw), but also innovations such as sustainable bio-textiles, bio-composites, 3-D printed biomaterials, recycled agro-food residues etc. This also helps to advance innovation and awareness including on social level, looking on the role of design, arts and culture, as technological capacities. The improved understanding of the social attitudes in diverse European regions forms an important part of this action.

This action should support the implementation of sustainable bio-based value chains, in the regional settings, by developing guidelines and creating feedback loops to the respective policy makers. Proposals should benefit from social creativity and opportunities for bio-based systems unleashed at regional scale ensuring their low environmental footprint and sustainability. Robust environmental evaluation should underpin the effort undertaken.

The proposals should seek complementarities with related actions on governance of bio-based innovation and ensure inclusiveness and engagement of all actors, especially SMEs, civil society organisations including NGOs and broader civil society (e.g. educational institutions, museums, science, art centres).

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. Proposal could explore intersectionality approaches and consider aspects like gender, ethnicity, migrant or refugee status, social class, sexual orientation and disability to ensure inclusion of marginalised groups in decision-making, citizen engagement and training activities.

Proposals should:

a. Analyse and develop guidelines on the regional bioeconomy-related skills/(re)-training/adult learning programmes to allow replication across Europe, taking into account the diversity of regional/local approaches, including the existing support measures (e.g. bioeconomy strategies, sectorial public and industry programmes and initiatives).

b. Assess and integrate the contribution from the humanities/art/design/culture into bioeconomy/bio-based economy sectors (e.g. role of innovation and sustainability for the new bio-based materials, new functionalities, safety, user-friendliness, understanding);

c. Ensure efficient exchange of best practice and engagement of all actors (e.g. regional and local authorities, SMEs, civil society organisations including NGOs, University alliances and

professionals' associations, knowledge providers, artists, designers and architects) via robust and transparent communication and awareness-rising campaigns;

d. Analyse and develop recommendations on social and economic barriers and potentialities (e.g. job creation capacity and its quality) to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society, including women, ethnic and religious minorities, migrants and refugees, the LGBTIQ community, disabled persons, youth and the elderly, etc);

e. Link with relevant activities under H2020, BBI JU, BIOEAST Initiative and EIT Knowledge and Innovation Communities, in particular their education efforts.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-GOVERNANCE-01-09: Revitalisation of European local communities with innovative bio-based business models and social innovation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal', and the European policies it supports, in particular the European Green Deal, and EU bioeconomy strategy, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation. In addition, the topic supports the strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

Projects results are expected to contribute to all following expected outcomes:

- Higher awareness of stakeholders (e.g. by development of a programme that focuses on helping local stakeholders, including primary biomass producers, civil society organisations including NGOs and SMEs to be integrated in and benefit from bio-based value chains) – identifying local actors and improve communication between them, showing opportunities for collaboration along the bio-based value chain.

- Increased opportunities to develop skilled jobs and small-scale establishments in the bioeconomy, thus helping to revitalise local communities (by supporting the local and regional rural development, economic and implementing authorities, to raise awareness of bio-based options)

- Advancement of the role of 'social enterprise' model for local communities, including the low-income populations, benefiting from creativity linked to bio-based solutions and promoting inclusiveness and cooperation at all levels.

- Increased opportunities created by the local bio-based economy within broader bioeconomy transition, e.g. by linking valorisation of ecosystem/nature services' (e.g. recreation) with sustainable biomass production, processing, product design and manufacture, circular use and upcycling to new applications.

- Supporting the development of for small businesses and for business-to-consumers communication of innovation, climate-neutrality and low environmental footprint/benefits/trade-offs and performances of bio-based products and services (e.g. by development of best practice guidelines);

- Supporting novel business models and related social measures to enable consumers, industry and public bodies to switch to socially and environmentally responsible behaviour within their choices (e.g. guidelines on regulatory measures, corporate responsibility initiatives, education); ensuring synergies, transparency and inclusiveness of all actors)

Scope: The action advances the role and impact of bio-based innovation to accelerate the transition from a linear fossil-based economy, which leads to overuse and depletion of natural resources, into a resource-efficient and circular bio-based systems operating safely within planetary boundaries. Improved and informed governance and especially social innovation contributes to reducing resource consumption and results in an increased innovation capacity of all actors, while reducing the risk of leaving anyone behind, particularly in the areas and communities in need of revitalisation. This also helps to advance innovation at local scale and engage all actors (especially the 'social enterprise' model relevant for vulnerable populations).

Proposals should benefit from social creativity and opportunities at regional scale unleashed for bio-based systems, ensuring their low environmental footprint, in terms of feedstock, resources, processes, materials and products. Impacts and trade-offs, such as the carbon footprint and environmental footprint of the whole value chains should be part of the assessment of the bio-based systems. The proposals should seek complementarities with related actions[145], under rural development programs on the governance of bio-based innovation and ensure inclusiveness and engagement of all actors.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake. Proposal could explore intersectionality approaches and consider aspects like gender, ethnicity, migrant or refugee status, social class, sexual orientation and disability to ensure inclusion of marginalised groups in citizen engagement and the development of tools and guidelines.

Proposals should:

f. select a range of bio-based systems where value chains can be tailored to specific needs in respect to the revitalisation of local communities (understood both in territorial and social

[145] such as the topic "HORIZON-CL6-2021-COMMUNITIES-01-02: Expertise and training centre on rural innovation"

sense), to their environmental and social impacts (benefits and trade-offs) from trade in the primary materials to the final products;

g. focus on relevant new or updated business models and local capacities (feedstocks, infrastructure, human skills, etc), and innovation actors (including community knowledge and marginalised groups), to enable sufficient impacts/benefits/positive trade-offs and performances of the specific value chains;

h. assess existing/develop new monitoring system and indicators of the effectiveness and robustness of existing governance schemes, to allow replication across Europe (e.g. income generation for all stakeholders, labour conditions, environmental indicators, social engagement, innovation parameters etc);

i. ensure efficient engagement of all actors (public authorities, SMEs, NGOs, knowledge providers) via robust and transparent communication and awareness-rising campaigns;

j. analyse social and economic barriers and potentialities to enable the transition towards socially and environmentally responsible behaviour within all ranges (e.g. regulatory measures, corporate responsibility initiatives, education), ensuring inclusiveness of all actors (NGOs, civil society etc).

HORIZON-CL6-2021-GOVERNANCE-01-10: Raising awareness of circular and sustainable bioeconomy in support of Member States to develop bioeconomy strategies and/or action plans

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal' "Innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, social engagement and innovation". This action will support Member States that do not have a bioeconomy strategy and/or an action plan in developing one as part of their preparation for a sustainable economic, social and environmental transition to climate neutrality as called for in the European Green Deal.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased awareness of decision makers and public administrators in different ministries about the various bioeconomy sectors, the role of the bioeconomy in the EU policies, the benefits of the bioeconomy and particularly the circular bio-based sector, including products substituting

fossil-based and carbon-intensive products and reducing of respective emissions of GHGs and other pollutants.

- Improved inter-ministerial interaction and engagement in Member States that are developing or are preparing to develop their Strategy and/or Action Plan through exchange of good practices and experiences at meetings and conferences.

- Increased awareness of the bioeconomy and its potential among a broad range of national stakeholders, such as the general public, knowledge providers, universities, investors, industry, primary producers and NGOs, through tools such as for example workshops, living lab activities, exhibitions.

- Better interconnection of stakeholders into national bioeconomy hubs with the aim of providing a framework and the assurance that even without national level strategic orientation they are in line with the EU objectives.

- Improved information about current policy instruments and solutions to bridge between strategies and actual policy, including exploitation of opportunities offered by the current EU policy framework (e.g. related to circular economy, energy, innovation, agriculture).

Scope: The European Green Deal, the Commission's growth strategy, has set Europe on its path to be the first climate neutral continent by 2050 and achieve a green transition that must be just, fair and inclusive. One of the seven core pathways to deliver on climate neutrality, identified in the Clean Planet Strategy is the bioeconomy. The updated EU bioeconomy strategy has highlighted the relevance of developing national bioeconomy strategies and action plans to deploy a sustainable and circular bioeconomy across Europe taking into account economic, social and environmental aspects.

To date, there are still Member States, including many from Central and Eastern Europe that do not have a national bioeconomy strategy and/or action plan despite their high biomass resource base and new bioeconomy potential. This topic should support Member States to develop strategies and/or action plans by improving knowledge and raising awareness of a sustainable, circular bioeconomy, its challenges and opportunities as well as experiences made elsewhere.

Moreover, the topic should help to bring together national stakeholders in deploying and fostering the bioeconomy related research and innovation developments by engaging local stakeholders into the participation in macro-regional and European thematic networks and into building the common European Research Area.

The focus of the topic should be two-fold: reaching out to decision makers and public administrators in different ministries as well as to a wide range of stakeholders crucial for the development of the national strategies and bioeconomy deployment across Europe. These stakeholders could consist for example of investors, industries, SMEs, feedstock providers (e.g. waste, side streams, farmers, foresters, fishermen). It is also relevant to cooperate and establish links with relevant existing initiatives such as the BIOEAST, EUBIONET, BBI JU and the Circular Bio-based Europe (CBE) Partnership.

This topic should ensure that Member States without bioeconomy strategies and/or action plans become equally empowered to make the transition to climate neutrality as those that already have a bioeconomy strategy in place.

HORIZON-CL6-2021-GOVERNANCE-01-11: Education on the bioeconomy including bio-based sectors for young people in primary and secondary education in Europe

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: Successful proposal(s) will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal's and support the European Green Deal priorities and the updated European bioeconomy strategy with the aim to accelerate the transition to a sustainable and circular bioeconomy in Europe. This will contribute to achievement of a climate-neutral Europe by 2050.

Projects results are expected to contribute to all of the following expected outcomes:

- Increased awareness of the environmental, social and economic benefits of sustainable and circular bioeconomy and its sectors, in particular bio-based sectors among young people at pre-school, elementary and high school level.
- Increased interest among new generations to join education and training on sustainable and circular behaviours and to become responsible consumers that will take on a sustainable and circular lifestyle; and new ways of attracting talent in the life science, technology and the bioeconomy opportunities.
- Innovative approaches to provide a toolkit with educational and information material, such as videos, games, social media, prize competitions, including nomination of "Bioeconomy Youth Ambassadors" campaigns for children and young adults in high schools.
- Preparing the younger generation to assume their role in the transition to a circular and sustainable bioeconomy, e.g. through the uptake of innovative solutions.
- Strengthened cooperation between teachers, parents and youth by developing new approaches.

Scope: The updated European bioeconomy strategy highlights the importance of education and increasing public awareness of all areas of the bioeconomy as crucial to understanding the challenges and the opportunities offered by the bioeconomy.

This topic should focus on the bioeconomy in general but with a specific focus on circular bio-based sectors and their potential, to prepare citizens for a future that should assume a sustainable and circular lifestyle (in terms of consumption, recycling, etc.) and to inspire young people to pursue education in life science, technology and bioeconomy related areas. The actions should promote the bioeconomy and bio-based solutions that provide environmental, climate-neutral and socio-

economic benefits through education, training and awareness raising on sustainable production, consumption and lifestyles by engaging children and young adults.

Strengthening the knowledge and sensitivity of future generations to environmental issues, sustainability and circularity through information and education programmes targeting younger generation can contribute to raising a future generation of decision-makers and a workforce that are informed and interested in bioeconomy.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2021-GOVERNANCE-01-12: EU agriculture within a safe and just operating space and planetary boundaries

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: Successful proposals will set out a credible pathway to contributing to innovative governance and sound decision making in policy for the transition of European agriculture required by the European Green Deal.

Project results are expected to contribute to the following expected outcomes:

- Boost EU and Associated Countries analytical and modelling capacity in agriculture in both bio-physical and socio-economic domains
- Develop an analytical and policy framework and timeframe for the European farming sector to operate within safe and just operating space and planetary boundaries and achieving EU climate change policy objectives
- Analyse policies and develop policy recommendations for the agricultural policies in Europe in 2030

Scope: In order to enable the transition to sustainable agriculture, it is crucial to establish the necessary policy framework and related monitoring and evaluation activities. This implies the development of appropriate tools for measurement and monitoring of socio-economic and biophysical data in order to model and project scenarios and derive the necessary targets, trajectories and relevant policy measures and the development of relevant analysis.

Projects should:

- operationalise the concept of safe and just operating space, including planetary boundaries, in the case of the EU agriculture and at different spatial scales;

- boost the analytical and modelling capacity of the EU and Associated Countries in the farming sector with a view to informing impact assessments and formulating policy recommendations, with a particular focus on conditions and policy measures for the EU farming sector to respect planetary boundaries, in particular regarding climate change and biodiversity, and safe and just operating space;

- work at various geographical scales, from local, national, EU to global levels, and simulations and projections should range from short / medium term (to capture the accelerating impact of climate change) to long term policy scenarios;

- Within a foresight exercise, develop post-2027 science-based targets for European farming allowing the sector to remain within the planetary boundaries and a safe and just operating space, and the conditions to achieve the targets, and develop a roadmap and the related policy framework to reach those objectives;

- mobilise running Horizon 2020 projects and build on their main results. It should aim to bridge gaps in modelling approaches relevant to the exercise, including those identified by the Horizon 2020 project Suprema. Projects should link in particular with the projects financed under RUR-03-2018 (CONSOLE[146], Contract2.0[147] and EFFECT[148]) and RUR-04-2018-2019 (Mind Step[149], BESTMAP[150] and AGRICORE[151]);

- include a task to collaborate with other projects financed under this topic and under topic HORIZON-CL6-2021-GOVERNANCE-01-13 "Modelling land use and land management in the context of climate change";

- work in a multidisciplinary manner and involve a broad community of scientists including climate, land, biodiversity, health, human, economic and environment sciences;

- establish a regular dialogue with the European Commission regarding objectives, timeline and main deliverables with the goal to provide analyses, analytical tools, simulations and policy recommendations for the common agricultural policy (CAP) post 2027, as well as other relevant EU programmes (for instance EU climate and biodiversity policies). The possible participation of the JRC in the project will ensure that the approach proposed will be compatible with and

146 https://console-project.eu/
147 https://www.project-contracts20.eu/
148 http://project-effect.eu/
149 https://mind-step.eu/
150 http://bestmap.eu/
151 https://agricore-project.eu/

improve the tools used at the European Commission. Project duration should not be shorter than four years;

- ensure that the proposed approach will be compatible with and improve the tools used at the European Commission.

As an option, necessary additional analysis and modelling may be supported through grants to third parties. In this case, the proposal must define the process of selecting entities for which financial support will be granted, of up to 60.000 EUR per third party. Grants to third parties may be utilised to ensure a comprehensive coverage of technical issues and the participation of pluralistic approaches to the analytical work on a series of key issues.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-GOVERNANCE-01-13: Modelling land use and land management in the context of climate change

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: Successful proposals will set out a credible pathway to contributing to innovative governance and sound decision making in policy for the transition required by the European Green Deal.

Project results are expected to contribute to the following expected outcomes:

- Boosting of economic and environmental modelling of land use and management and carbon sequestration in Europe and use of modelling for policy purposes (mainly climate policy, agricultural policy, land use policy).

- Contribution to the formulation, implementation and monitoring of land-related issues of agriculture and forestry policies, in particular linked to climate change.

Scope: To ensure the sustainable management of land resources in the long term there is a need for an integrated framework that addresses society's objectives appropriately by understanding the trade-offs between uses and by incentivising actions / behaviours / investments contributing to desirable targets. Land use and management has a key role to play in Europe in terms of boosting carbon storage, producing biomass for the bioeconomy, reducing urban sprawl and attaining the objective of climate neutrality by 2050 while ensuring food and nutrition security, biodiversity commitments and well-being in general. There are however substantial knowledge gaps regarding, in particular, the understanding of the impacts of farming / forestry practices at various scales, from local to global, and the capacity to model these impacts (economic and environmental). Work should include the analysis of land use dynamics and trends between arable land, permanent grassland, land abandonment / marginal lands, forest areas, for which quantifications and an identification of drivers and impacts should be done in an integrated manner.

Projects should:

- work on land use dynamics and explore the effects of policy measures that can influence such dynamics, in particular agricultural, land use and climate policies.
- focus activities mainly on agriculture and forest land use/cover and should extend to interactions of the former with other main land uses/covers and drivers. This should ensure usability of the results in larger contexts. While focusing on Europe, proposals are encouraged to draw on good examples from elsewhere.
- work at various spatial scales – farm level, regional to EU levels - and simulations and projections should range from medium-term to long-term policy scenarios and should cover the whole of the EU and its Member States and possibly Associated Countries.
- The possible participation of the JRC in the projects will ensure that the proposed approach will be compatible with and/or improve existing databases and tools used at the European Commission and ensure open access to data.
- include a task to collaborate with other projects financed under this topic and under topic HORIZON-CL6-2021-GOVERNANCE-01-12 “EU agriculture within a safe and just operating space and planetary boundaries”. They should also liaise with relevant Horizon 2020 modelling projects (including LandSupport[152]).

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2021-GOVERNANCE-01-14: User-oriented solutions building on environmental observation to monitor critical ecosystems and biodiversity loss and vulnerability in the European Union

Specific conditions

152 https://www.landsupport.eu/

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).

Expected Outcome: A successful proposal will support the delivery of services and solutions for the implementation of the European Green Deal and the biodiversity strategy, through the deployment and exploitation of environmental observations[153], benefiting a broad range of end users and helping them restore biodiversity and ecosystems under threat, thus contributing to the global observation and monitoring of the living realm.

Proposals are expected to contribute to at least four of the following outcomes:

- Better informed policy formulation for biodiversity & ecosystem services on European/national and regional level, built on enhanced understanding of better quantified and characterised changes in biodiversity and ecosystem services and the prediction of their trajectories;

- Enhanced understanding of the adverse cumulative impacts of climate change and anthropogenic activities on biodiversity and ecosystem functioning and in particular on habitats and key species at risk of extinction in sensitive ecosystems to define enhanced management, adaptation and mitigation actions;

- Enhanced planning and ecosystem-based management of land and sea with the objectives to minimise the adverse effects of climate change and anthropogenic activities on ecosystems and biodiversity;

- Dependable data, information and knowledge to support adaptation and mitigation of biodiversity loss resulting from climate change and anthropogenic activities, through maximised exploitation of information and data from European data infrastructures, European programmes (such as EMODnet[154] and European research infrastructures[155]) and GEO[156] initiatives;

153 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

154 https://www.emodnet.eu/en

155 https://www.esfri.eu/

156 http://www.earthobservations.org/index.php

- Support to the development of the European service sector regarding end-user climate services related to biodiversity and ecosystems and deliver usable results to the monitoring framework of the EU biodiversity strategy for 2030;

- A contribution to the EC-ESA joint Earth system science initiative[157] (in particular to the flagship action on biodiversity and ocean health);

- Improved governance of biodiversity monitoring and reporting, in particular together with the 'Rescuing biodiversity to safeguard live on Earth' partnership[158], the EC Knowledge Centre for Biodiversity and GEOBON[159].

Scope: The projects are expected to further the harmonisation, mobilisation, and uptake of monitoring and environmental data to better characterise and understand the natural and anthropogenic pressures on biodiversity, the extent of the destruction of natural biological resources and its connection with ecosystem conditions within safe planetary boundaries. There is a need for knowledge of both better quantified and more precisely characterised changes in biodiversity and related ecosystem services (in coastal, marine, terrestrial and freshwater ecosystems), and of ecosystem status and quantified impacts of the main direct drivers of changes (i.e. land and sea use changes, pollutions, climate change, invasive alien species and exploitation of natural resources) on European natural capital.

The projects should deliver new Earth observation (EO) data services building on the potential of EO capabilities in order to address end-user needs facing the deterioration and destruction of their living environment and ecosystems. The projects under this topic should tackle issues raised within the European Green Deal calls[160] and provide solutions to halt biodiversity loss and protect vulnerable ecosystems, and ensuring ecosystem capacity to continue to provide services to society and the environment. The projects should make mapping tools and information solutions available, which are needed by a wide variety of end users in order to meet targets for conservation and restoration of diverse terrestrial, coastal and marine ecosystems. Hence, the development of tools to support decision-making and participatory management are crucial in this context. Solutions related to improving ecosystem health and resilience should be integrated into best practice monitoring activities within respective monitoring governance schemes. This should enable stakeholders and policy makers to take the right conservation and restoration measures, in particular with the use of a holistic ecosystem-based management in response to the urgent need for halting biodiversity loss and, consequently, alterations to ecosystem functions and sustain the delivery of precious ecosystem services.

Building on existing services and frameworks provided through GEO, EuroGEO[161], European research infrastructures, European Ocean Observing Systems, EMODnet, Copernicus, ESA[162] Earth Observation programmes and EGNSS, this topic should address the downstream part of the value chain to support mitigation and adaptation to climate change impact on biodiversity and ecosystems. The consortia should engage with end users and stakeholders, contribute to customising of data and exploitation platforms, deliver scaling-up and replication of existing service models, and brokerage of knowledge

157 https://eo4society.esa.int/communities/scientists/ec-esa-joint-initiative-on-earth-system-science/
158 https://ec.europa.eu/info/files/european-partnership-rescuing-biodiversity-safeguard-life-earth_en
159 https://geobon.org/
160 https://ec.europa.eu/easme/en/news/european-green-deal-call
161 https://ec.europa.eu/info/research-and-innovation/knowledge-publications-tools-and-data/knowledge-centres-and-data-portals/eurogeo_en
162 https://www.esa.int/

and dissemination to the public. The successful proposals should build on outcomes of EU funded projects such as Horizon 2020 projects like ECOPOTENTIAL[163], initiatives like EuropaBON[164] and programmes like LIFE[165], and should feed into the EC Knowledge Centre for Biodiversity, and deliver usable results to the monitoring framework of the EU biodiversity strategy for 2030.

HORIZON-CL6-2021-GOVERNANCE-01-15: Preparing for pre-commercial procurement (PCP) for end-user services based on environmental observation in the area of climate change adaptation and mitigation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The successful proposal will support the preparation, facilitation and pavement of the way for pre-commercial procurement in the area of climate change adaptation and mitigation to enable up-scaling and wide use of end-user services to respond to common needs in this area. The successful proposal will be contributing to the European Green Deal objectives by further deploying and exploiting the use of environmental observations[166].

In order to do so the project is expected to contribute to all of the following outcomes:

- Creation of a critical mass of procurers of solutions and services in the area of climate change adaption and mitigation, which will undertake joint, cross-border or coordinated procurements;
- Description of the common needs of the public procurers for end-user services in the area of climate change adaption and mitigation;
- Reduced fragmentation of public sector demand via creation of a network(s) of public procurers capable of collectively implementing PCPs and/or public procurement of innovative solutions (PPIs);
- Increased awareness in the network of procurers of relevant standards, certification and GEO data sharing principles;
- Leverage of additional investment in research and innovation in the domain of environmental observation and the Copernicus Climate Change Service;

163 http://www.ecopotential-project.eu/ps://www.esa.int/
164 https://europabon.org/
165 https://ec.europa.eu/easme/en/life
166 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

- Increased awareness and successful use of public procurement to boost innovation and increased exchange of experience in procurement practices and strategies (organising trainings and other information exchange tools) in the specific area of climate services.

Scope: The project is expected to prepare a pre-commercial procurement due to be part of the Cluster 6 work programme for 2023 in the domain of climate change services using the information and data from the Copernicus programme, GEO initiatives, other relevant initiatives such as EMODnet, European Commission Knowledge Centre on Earth Observation hosted at JRC, European research infrastructures and the broad range of environmental information.

The action should deliver all the necessary elements in preparation of the PCP as described in Annex H of the general annexes to this work programme.

Proposals should lead to the establishment of a critical mass of public and/or private procurers in the area of climate change adaptation and mitigation, to overcome the fragmentation of demand for solutions and services and to lead to a more rapid market uptake of such solutions and their early deployment. Demonstrated engagement from participants for a further Europe-wide take-up and rollout of results during and following the proposal are expected. Proposals should implement an open market consultation to gain insights into state-of-the-art technologies and ongoing developments, including prototypes and demonstration services coming out of relevant Horizon 2020, Horizon Europe, ESA and national projects. This could include new approaches for market consultations with suppliers, paying special attention to SME suppliers.

Proposals should engage public and/or private procurers from each country participating (at national, regional or local level) that have responsibilities and budget control in the relevant area(s).

The network(s) of public and/or private procurers created should investigate the feasibility of, test and prepare the launch of joint or coordinated procurements (PCP), which would ultimately develop innovative, fully tested, fit-for-purpose and cost-effective end-user services in the area of climate change adaptation and mitigation. These solutions should be based on a complete set of common needs and specifications. Finally, to facilitate future replication, a set of well-documented practices should be made available.

Preparation activities for the joint or coordinated PCP will be supported, but not the costs of the procurement resulting from any PCP procedures.

Project duration should be 24 months.

HORIZON-CL6-2021-GOVERNANCE-01-16: Tools to support the uptake and accessibility/exploitability of environmental observation information at European and global level

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 13.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.00 million.

Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will enhance access and usability of environmental observation[167] information and promote pre-operational European services through global infrastructures in line with the objectives of the European Green Deal, the European strategy for data and the European digital strategy, thus deploying and adding value to environmental observations and contributing to a strengthened Global Earth Observation System of Systems (GEOSS).

Proposals are expected to contribute to all of the following outcomes:

- Conversion of existing environmental platforms into fully interoperable digital ecosystems, taking advantage of the progresses made in artificial intelligence, machine learning and high performance computing;

- Enhance the FAIRness (findability, accessibility, interoperability and re-usability) of environmental observation data, for example, through annotations turning them into relevant, open and accessible knowledge and provide support to decision makers involved in implementing the objectives of the European Green Deal [168], the new EU climate adaptation strategy[169] and European strategy of data[170];

- Improve the environmental observation knowledge at regional and local level across all European regions, leveraging existing platforms to foster the usability and practicability of digital services in support to the Horizon Europe missions and partnerships;

- Better access for European stakeholders to global environmental observation data, actionable information and knowledge, especially to the data derived from European programmes such as Copernicus[171], Galileo[172]/EGNOS[173] and INSPIRE[174] to establish a common European Green Deal data space, fully interlinked with the common European data space for research and innovation and the European Open Science Cloud;

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167 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

168 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

169 https://ec.europa.eu/clima/news/commission-launches-online-public-consultation-new-eu-strategy-adaptation-climate-change_en

170 https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

171 https://www.copernicus.eu/en

172 https://www.gsc-europa.eu/

173 https://egnos-user-support.essp-sas.eu/new_egnos_ops/

174 https://inspire.ec.europa.eu/

- Contribution to the Destination Earth initiative[175].

Scope: The project is expected to enhance access and usability to environmental observation information and promote pre-operational European services through global infrastructures, notably through the GEOSS (Global Earth Observation System of Systems) infrastructure. Proposals should turn existing platforms into consolidated digital systems which provide analytical tools, including machine learning for large-scale analysis, improve the value of environmental observations (including in-situ data) to enrich the knowledge base needed to facilitate the reduction of anthropogenic impacts and to assure on optimal management of the transition to a climate neutral economy and a more resilient society.

Proposals should build on the relevant existing infrastructures[176] and facilitate access and exploitation of EO derived data. The tools and services developed under the proposal(s) should be made available for future integration in the common topical European open infrastructure, Destination Earth. Proposals should deliver a plan for the sustained uptake of services by the European commercial sector and leverage the tools developed for the benefit of users from a variety of different sectors (e.g. public, private, civil society, citizen science). Proposals should contribute to support the EC-ESA initiative on Earth system science[177].

HORIZON-CL6-2021-GOVERNANCE-01-17: Common European Green Deal data space to provide more accessible and exploitable environmental observation data in support of the European Green Deal priority actions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 3.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based Earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

175 https://ec.europa.eu/digital-single-market/en/destination-earth-destine

176 Such as the Copernicus DIAS, the European Open Science Cloud, EMODNet, the European research infrastructures, the Euro Data Cube, the GEOSS Infrastructure, INSPIRE and GBIF (Global Biodiversity Information Facility).

177 https://eo4society.esa.int/communities/scientists/ec-esa-joint-initiative-on-earth-system-science/

Expected Outcome: A successful proposal will contribute to unleashing the potential of environmental and climate data through dedicated European data spaces in line with the objectives of the European Green Deal and the European strategy for data, by further deploying digital and data technologies as key enablers and strengthening EU and international science-policy interfaces as well as contributing to the Global Earth Observation System of Systems (GEOSS).

Proposals are expected to contribute to all of the following outcomes:

- Available FAIR[178] data, information and knowledge in support of the European Green Deal priority actions on climate change, circular economy, zero pollution, biodiversity, deforestation and compliance assurance;

- Consolidated arrangements for European Green Deal data access, sharing and interoperability, in line with the FAIR principles for data, to facilitate the combination of data for policy analysis fostering as such innovative data analytic solutions;

- Concrete solutions and tools using data analytics and machine learning techniques to support to the European Green Deal priority actions;

- Increased convergence of the use of high performance computing, cloud, edge, computing, data analytics and artificial intelligence resources for Earth system modelling.

Scope: Successful proposals are expected to contribute towards unleashing the potential of environmental, biodiversity and climate data through dedicated European data spaces. This should allow to exploit the major potential of environmental observation[179] data in support of one or more of the European Green Deal priority actions: climate change, circular economy, zero pollution, biodiversity, deforestation and compliance assurance. Successful proposals are expected to address these challenges and contribute across all environmental areas to help harness the power of big data and artificial intelligence for the benefits of the European Green Deal. The proposals should also help in the convergence of use of high performance computing, cloud, data and artificial intelligence resources for Earth system modelling.

Proposals should contribute to the implementation of the European strategy for data in the domain of environment/climate and could act as a digital enabler for the European Green Deal in those domains. To provide a sustainable perspective for the results achieved, the data and services developed under the proposals should firmly aim to be connected into the common topical European open infrastructure, Destination Earth. Proposals should leverage environmental, geospatial and climate-related data, which are a prerequisite to better understand issues and trends on how our planet and its climate are changing and to address the role humans play in these changes. Proposals should contribute to the release and use of those data to strengthen evidence-based analytical capabilities for policy-making and implementation, including through building on the planned efforts of the European Commission Knowledge Centres on Earth Observation, Biodiversity and Bio-economy hosted at JRC. Proposals should deliver open access to data useful for decision-making by public administrations, investors, insurers, businesses, cities, rural communities, citizen scientists, civil society and citizens, and for the development of new instruments to integrate climate change into risk management practices across the EU. Proposals should build on significant gains in our knowledge over the past decades on data management, to contribute to defragmenting data flows

178 Findable, Accessible, Interoperable and Re-usable

179 The capacity to observe the environment, including space-based, in-situ-based (air, sea, land) observation, and citizen observations

across topics, time and space, and develop best practices in the use of existing relevant platforms such as the Copernicus DIAS and the GEOSS infrastructure, or platforms in development under e.g. Destination Earth[180], and communities in order to help prioritise and direct the efforts undertaken in the context of the European strategy for data.

HORIZON-CL6-2021-GOVERNANCE-01-19: Development of the markets and use of digital technologies and infrastructure in agriculture – state of play and foresight: digital and data technologies for the agricultural sector in a fast changing regulatory, trade and technical environment

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the farm to fork Strategy and the headline ambitions of a Digital Age – the European Strategy for data in particular - and the headline ambition an Economy that works for people, leaving no one behind, the successful proposal(s) will support the capacities to understand and develop the markets and use of digital technologies in agriculture. They will therefore contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, and innovation through research and innovation in the field of digital technologies and infrastructure in agriculture.

Project results are expected to contribute to all of the following expected outcomes:

- Increase transparency in the markets for digital and data technologies in the agricultural sector and in data sharing in the agricultural value chain, and support competition;
- Lower the risk of investments in digital and data technologies in the agricultural sector;
- Strengthen policy-making and-monitoring and foresight capacities in agriculture and digital and data technologies;

180 https://ec.europa.eu/digital-single-market/en/destination-earth-destine

- Contribute to an increased uptake of digital and data technologies in the agricultural sector and indirectly contribute to an increase in environmental and economic performance of the agricultural sector through increased and enhanced used of digital technologies and data.

Scope: The potential of digital technologies in the agricultural sector to enhance its sustainability and economic performance and to enhance working conditions has been acknowledged. The uptake of digital technologies in the agricultural sector and the development of supplementing data-technology-based solutions in the EU are increasing. However, there is hardly comprehensive, independently collected data about the actual uptake and use of digital technologies by farmers, the trade of sector-related digital technologies, and about the extent and structure of the provision of digital and data services in the agri-food supply chain, which is of global outreach.

To the same time, policies and the regulatory framework directly or indirectly influencing the deployment of digital and data technologies in the EU is evolving in a fast pace and will continue to do so.[181] Also trade regimes are continuously changing. For stakeholder in the agricultural and the digital sector to invest in digital and data technologies, it is important to be able to assess the possible implications of changing regulatory and market conditions on the development, purchase and use of digital and data technologies in the agricultural sector.

An increase in information on markets and on the actor networks, and of the storage and the flows of goods and data, increases transparency, strengthens the consumers`/ users` position and boost competition.

Capacities in modelling and in carrying out foresight analyses for the development of markets and of the situation in the agricultural sector is also one pre-requisite for tailored policy-making.

Proposals should cover all of the following aspects:

- Development of innovative approaches to assess the uptake of digital technologies and digital infrastructure (including platforms) in the agricultural sector globally with special attention to the situation in the EU and associated countries;

- Development of innovative approaches to forecast the markets and the uptake of digital technologies and digital infrastructure (including platforms) globally with special attention to the situation in the EU under consideration of fast-changing regulatory framing conditions in the fields of data-, digital and machinery technologies and of agricultural policies;

- Demonstration of the qualitative and quantitative implications for the use of digital and data technologies by farmers and other actors along the supply chain in a way that demonstration results can be steadily adapted to changing framing conditions. Demonstrations should allow for the reflection of scenarios.

Proposals are expected to consider innovation in digital technologies brought onto the market during the life-time of the project. They must implement the multi-actor approach involving targeted stakeholders, including farmers, agri-businesses, policymakers etc. to test demonstration and communication tools. They should also provide a basis for the development of business cases, e.g. for the integration and sharing of databases across entities and infrastructure.

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181 See, e.g. the announcements in the Digital package published by the European Commission in February 2020, and the Data Strategy in the package, in particular. https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy.

For the assessment of the uptake of digital technologies by farmers, statistic approaches evolving in the EU are to be considered; assessment approaches may vary between continents and regions.

HORIZON-CL6-2021-GOVERNANCE-01-20: Data economy in the field of agriculture – effects of data sharing and big data

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions

Expected Outcome: In line with the farm to fork strategy and the Headline ambitions of a Digital Age –the data Strategy in particular - and the headline ambition an Economy that works for people, leaving no one behind, the successful proposals will support capacities to understand, develop and demonstrate the data economy in agriculture and its effects. This topic aims to contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes through research and innovation related to data economy in agriculture.

Project results are expected to contribute to all of the following expected outcomes:

- Awareness and informed decisions based on the demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.[182]
- Increase in transparency in data sharing in the agricultural value chain.
- Increased sharing of agricultural data, and the effective and efficient use of private and public data for private and public purpose, particularly through the demonstration of the costs, benefits, risks, and added value as well as the economic and societal potential of agricultural data sharing taking an EU perspective.[183]
- Contribute to an increased uptake of digital and data technologies in the agricultural sector and indirectly contribute an increase in environmental and economic performance of the agricultural sector through increased and enhanced used of digital technologies and data.
- Strengthen policy-making and-monitoring capacities in agriculture and data technologies.

[182] The main focus is with the agricultural sector and public interests in the EU. However, as data flows and trade relations are global, analyses have to go beyond the EU context.

[183] The main focus is with the agricultural sector and public interests in the EU. However, as data flows and trade relations are global, analyses have to go beyond the EU context.

Scope: Used effectively, agricultural data has the potential to increase the performance of the sector and of businesses along the supply chain in a sustainable way as well to as to serve public good purposes. For instance, agricultural data forms a key input to precision farming applications and can form input to the analysis on environmental conditions as well as to other fields, e.g. bioinformatics. Thus, agricultural data has a value and presents an interesting element for the data economy.

A crucial parameter to the effectiveness and efficiency of the application of data technologies is the quantity and quality of agricultural data serving as basis for such analyses. However, agricultural data, which stems from multiple sources and includes business, personal and public data, is not straightforward accessible, not even for fees/ financial resources.

Next to technical issues related to e.g. data interoperability, questions on the ownership of agricultural data and the readiness to share the data present a burden to the use of agricultural data. Farmers, for instance, need to trust that their farm data is handled and share carefully, and have to see their and societal benefits to share the data, and have a stake in the economic benefits of agricultural data.

Currently, some companies in the agri-food value chain are collecting agricultural data, e.g. through farmers as customers. Not always is the use of that data, e.g. for product development or farm-tailored advertisement, fully transparent. Moreover, some companies with high numbers of customers, easily gain enormous market power and generate income through the use of the collected data and the application of data technologies.

Developments in the agricultural sector as well as in EU policies[184], which are/ will be addressing those circumstance to increase the readiness to data sharing to increase the benefit for the economy and society and to overcome power imbalances and a lack of transparency in the use of data, occur rapidly. These changing framing conditions offer opportunities as well as challenges to the agricultural sector as well as to the data economy.

Proposals should cover all of the following aspects:

- Quantitative and qualitative analyses of the effects of various data sharing and marketing and use options (considering among others private and public data, private and public actions, and big data opportunities) for the actors along the agri-food supply chain and the development of scenarios for the data economy.

- Implications of the ongoing policy-making process at EU level including the development of relevant legislation in the analyses.

- Effects of multi-level governance systems in the EU under consideration of the situation and conditions in various Member States as well as effects of international (trade) relations.

- Consideration of multiple data-sharing business- and governance approaches and technical solution in data sharing in the agricultural sector.

- Consideration of climate adaptation and reducing administrative burden in the assessment of the potential of agricultural data sharing for the sector and the society.

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184 Key policy ambitions related to the data economy and the use of data for the society/ the public good are reflected in a "European Strategy for Data" published by the European Commission in February 2020 (see https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy).

HORIZON-CL6-2021-GOVERNANCE-01-21: Potential of drones as multi-purpose vehicle – risks and added values

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: In line with the farm to fork strategy and the Headline ambitions of a Digital Age and an Economy that works for people, that works for all, leaving no one behind, the biodiversity strategy, the successful proposals will support the effective and efficient deployment of drones, including in the field of environmental monitoring. They will therefore contribute a) to the enhancement of the sustainability performance and competitiveness in agriculture, forestry and rural areas through further deployment of digital and data technologies as key enablers, and b) to the development of innovative governance models enabling sustainability and resilience, notably to achieve better informed decision-making processes through research and innovation in the field of drones.

Projects results are expected to contribute to all of the following expected outcomes:

- Strengthened capacities for sustainable smart farming, forestry and rural communities through exploiting the potential of drones and other remotely piloted aircraft systems.
- Strengthened the capacities for plant, plant-health, livestock, livestock-heath, and agri-environmental monitoring (including tree health) through the use of drones and other remotely piloted aircraft systems.
- Reduced risk of the use of drones and other remotely piloted aircraft systems.

Scope: The increased use of drones for sectoral and societal purposes can be observed in the EU. Also in the field of agricultural production, drones are used in the EU, whereby to different extents across Member States because of environmental, socio-economic and also regulatory framing conditions. While the use of drones can bring advantages to agricultural production, e.g. to collect data on crop conditions, it also goes along with risks emanating from the use of the unmanned

vehicle itself, or the activity it is carrying out. For several reasons, e.g. a lack of cost-effectiveness, the potential of drones is not fully exploited by the agricultural sector in the EU. When exploring the opportunities to increase the use of drones, the consideration of aspects related to the safe use and the interests of the society at large, which might be negatively affected by the use of drones, is of outermost importance. To the same time, drones can also deliver services of common interests, which have the potential to be well linked to the agricultural use of drones, for instance, the collection of environmental information in agricultural landscapes, such as about landscape features, water quality or soil quality, and biodiversity in and around utilised agricultural areas. Exploring possibilities to use drones as multi-purpose vehicle in rural areas, e.g. for reasons of cost-effectiveness is of interest.

Proposals should cover all of the following aspects:

- Stock-taking of innovation in the use of drones as multi-purpose vehicle in agricultural production, forestry and the development of rural communities globally, the advantage and disadvantages of different approaches, and perform comparative analyses with the situation of the use of drones in the EU.

- Development of innovative approaches to use drones and other remotely piloted aircraft systems as multi-purpose vehicle in agriculture, e.g. for production assessment, cover-crop seeding, pest and disease detection, harvesting planning as well as innovative approaches to use drones as multi-purpose vehicle linking agricultural and wider environmental observation interests (including the assessment of landscape features, forests, water quality, and soil carbon) and for rural services.

- Assessment of the potential of the use of drones and other remotely piloted aircraft systems in the agricultural sector and socio-economic and environmental effects under consideration of different regulatory scenarios.

- Development of business models to the use of drones and other remotely piloted aircraft systems in agriculture, which may include agriculture / forestry / community development interlinkages.

- Development of innovative approaches to assess and reduce the risks related to the use of drones in the agricultural sector, especially in the context of spraying.

Projects are expected to take into consideration the results of other related Horizon 2020/ Europe projects, such as AW-Drones[185] and ROMI[186], as well as of other relevant projects and initiatives.

Proposals may involve financial support to third parties e.g. to academic researchers, hi-tech startups, SMEs, rural communities and other multidisciplinary actors, to, for instance, develop, test or validate developed assessment approaches or collect or prepare data sets or provide other contributions to achieve the project objectives. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

185 Funded under Horizon2020 call MG-2-3-2018.
186 Funded under Horizon2020 call SFS-05-2017.

HORIZON-CL6-2021-GOVERNANCE-01-22: Assessing the impacts of digital technologies in agriculture – cost, benefits and potential for sustainability gains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the farm to fork strategy and the Headline ambitions of a Digital Age and an Economy that works for people, leaving no one behind, the biodiversity strategy, the successful proposals will support the development of capacities for assessing and demonstrating environmental and socio-economic effects of digital technologies in agriculture. They will therefore contribute to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers through research and innovation in the field of the assessment of impacts of digital technologies in agriculture.

Projects results are expected to contribute to all of the following expected outcomes:

- Awareness and informed decisions based on the demonstration of the costs and benefits of the use of digital technologies for the agricultural sector.
- Facilitated uptake of digital technologies by farmers, including through decision-making support and the analysis of farmers' motivations.
- Strengthen the capacities of farmers` advisors in the field of digital technologies.
- Strengthening the capacities to design, implement, monitor and evaluate policy measures in the fields of agriculture, environment and climate, as basis for better tailored, more effective and efficient policy measures in the fields of digitalisation in agriculture, and sustainability.

Scope: Digital technologies in agriculture and their potential to increase farms` economic and sustainability performance, facilitate work and enhance working conditions has received huge attention in the political sphere in recent years. Agriculture has to play a key role in achieving environmental and climate ambitions in the EU, and digital technologies offer opportunities to increase the sustainability performance of the agricultural sector. However, there is still a huge "gap"

between the portfolio of digital technologies offered at the market and the actual uptake and use by farmers in the EU. Moreover, while the potential of digital technologies to better tailor agricultural production is widely acknowledged, there is little knowledge about the actual reduction of negative environmental and climate effects due to their application.

Studies show that among key uptake barriers hindering the farmers to make use of digital technologies are a) a lack of knowledge about those tools in general, as well as their costs and benefits, b) a lack of overview of the strengths and weaknesses of certain tools in the huge portfolio offered on markets and the suitability to address farm-specific needs, and c) a lack of believe in the added value of digital technologies for the management of a farm. An additional barrier to the uptake of digital technologies by farmers presents the effort needed to become familiar with new tools. For many farmers the real demonstration of effects as well as "hard figures" of production effects are important to be convinced to apply a certain method/ technology. Also cultural aspects play a role in the perception of digital technologies.

The effectiveness of digital technologies as it regards sustainability gains between laboratory conditions and the environmental and socio-economic reality vary.

Independent assessments of the effects of the use of the range of digital technologies tools under ideal and real-life conditions are essential for policy development, monitoring and evaluation. For many environmental parameters, the final impacts of farming can only be assessed with a huge time lag/ delay or are hardly measurable at all. The more important it is, to have figures, which impacts certain farming practices may have.

In addition, policy-makers and administrations are challenged by estimating rates for supporting the use of digital technologies in agriculture as well as the effects of employment structures in rural areas.

Against this background, independent quantitative and qualitative assessments of the multiple costs and benefits and potential sustainability gains of digital technologies are essential. It is also important to make those assessment results of possible effects of digital technologies feasible, assessable and usable, particularly for farmers, their advisors, and policy-makers, as it may form a stepping stone to facilitate the uptake of digital technologies in the sector and may facilitate the design of tailored policy measures.

Proposals should cover all of the following aspects:

- Demonstration of the costs and benefits for farmers/farms of the use of digital technologies for individual production steps (e.g. in per ha calculations and livestock surveillance) as well as for following a "whole-farm approach" which is applied, e.g. in the use of some Farm Management Systems under real testing conditions and with quantitative and qualitative assessments.

- Analyses and developed assessment approaches representative for the EU under consideration of the various biogeographical conditions, and several types of farms and farmers under consideration of different business models, e.g. cooperative purchase of equipment, use of contractor services etc.

- Stock-taking of results of former or still ongoing Horizon 2020 projects falling directly or indirectly under the scope of this theme, e.g. Smart-AKIS[187], to capitalise those findings and draw lessons learnt.

- Provision of innovative decision-making support on the selection and use of digital technologies.

- Generation of information and knowledge for the design of policy measures.

- Recommendations, under which conditions/ in which way digital technologies deliver best results for a farmer and on business models for financing/ for financing their use.

- Generation of innovative tools making the results of the projects easily accessible and usable for the different target groups (at least farmers and advisors), e.g. cost calculators.

- Facilitated qualitative and quantitative assessment of the (positive and negative) environmental effects (e.g. reduction of inputs/ emissions) of the use of digital technologies in agriculture.

Projects are expected to foster the development of capacities for assessing the contribution of agriculture to sustainability ambitions through the development of assessment approaches, analyses, and knowledge generation on the impacts, especially the costs, benefits and potential sustainability gains and losses, through the application of digital technologies. Projects are expected to make a significant contribution to establish a basis for the development, implementation and evaluation of sustainability- and data-related policies at regional, national and EU level and reaching related objectives, including Green Deal ambitions, CAP, the White Paper on Artificial Intelligence, and Sustainable Finance.

Proposals should cover all of the following aspects:

- Testing of digital technologies in agriculture under real production conditions.

- Consideration of farmers´/ producers´/ contractors´ behaviour.

- Representativeness of analyses and developed assessment approaches for the EU and associated countries for several types of farms and farmers.

- Links to relevant EU policy monitoring and evaluations and statistical systems.

- Exploration of the potential of digital technologies use in agriculture as means for independent monitoring.

- Recommendations under which conditions/ in which way digital technologies deliver best sustainability performance.

Tools developed within the project(s) are to be linkable to Agricultural Knowledge and Innovation Systems in Member States.

The multi-actor approach must be implemented, involving at least scientists and representatives of the agricultural sector. They are encouraged to envisage collaboration with Digital Innovation Hubs[188]

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187 The Thematic network Smart-AKIS was funded under call Horizon2020 ISIB-02-2015, see https://cordis.europa.eu/project/id/696294.

188 For more information on Digital Innovation Hubs, please see https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs.

supported under the Digital Europe Programme is regarded as beneficial for the overall results of the projects.

If involving machinery companies, selected projects should build their work on digital technologies and machinery from at least three companies and brands.

The possible participation of the JRC in the project will ensure that the approach proposed will be compatible with and improve the tools used at the European Commission.

HORIZON-CL6-2021-GOVERNANCE-01-23: Broaden EIP Operational Group outcomes across borders by means of thematic networks, compiling and sharing knowledge ready for practice

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In support of the Green Deal, CAP and farm to fork objectives and targets, the successful proposal will focus on knowledge sharing in a language that is easy to understand and is targeted to farmers and foresters. Primary producers have a particular need for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS[189]).

Despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, and often research findings are not integrated into agricultural and forestry practice. Proposals, acting at EU level to remedy this, are essential because national and sectoral AKISs are insufficiently connected and organised to fully meet the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will

189 AKIS means the organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields (Agricultural Knowledge and Innovation

foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors. It will scale up local solutions up to the EU level and may even influence policy design wherever useful.

Project results are expected to contribute to the following outcomes:

1. The collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners.

2. The conservation of practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels that farmers/foresters consult most often, delivering as much audio-visual material and as many “practice abstracts” in the common European innovation partnership "Agricultural productivity and sustainability" (EIP-AGRI) format as possible, including also education and training materials.

3. Increasing the flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system.

4. Achieving greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.

5. The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake[190], as well as contributing to the European Green deal and Farm to Fork objectives. Examples are climate issues, pesticide use, water use and pollution, short supply chains linking to the consumer, farm viability, animal welfare, generational renewal, and much more.

Scope: Proposals should address the following activities:

- Tackling the most urgent needs of farmers and foresters by building on the experience and outcomes of at least 5 EIP-AGRI[191] Operational Groups of at least 3 Member States, scaling it up at European level choosing a related common theme on which to collect, summarise, share and translate the existing knowledge from science and practice in an easy-to-understand way for practitioners.

- Compiling a comprehensive description of the state of current farming and forestry practices on the chosen theme with a view to explain the added-value of the proposal and the relevance of the theme. Proposals must pay attention to the cost/benefit aspects of the practices collected and summarised, and clarify how the project avoids duplication with ongoing or completed projects and networks.

190 Art 5 CAP post 2020 proposal

191 EIP-AGRI : European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability’

- Delivering an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, and feed into the existing dissemination channels most consulted by farmers and foresters in the countries.

- All materials should also be provided in the common EIP-AGRI format to the EIP-AGRI as 'practice abstracts', as well as to the national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-24) in the requested formats.

- Besides giving the details about the EIP-AGRI Operational Groups which are involved[192], wherever possible and relevant to the chosen theme, provide also details on how further synergies shall be built with running and future EIP-AGRI Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.

- Proposals must implement the 'multi-actor approach', with a consortium based on a balanced mix of actors with complementary knowledge in particular activating farmers/foresters, farmers' groups and advisors and run for minimum three years.

HORIZON-CL6-2021-GOVERNANCE-01-24: Supporting knowledge exchange between all AKIS actors in the Member States by means of an EU-wide interactive knowledge reservoir

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In support of the Green Deal, common agricultural policy and farm to fork objectives and targets, the successful proposal will focus on appropriate management of data and information derived from different sources that are readily available. The expected outcome of this topic is to multiply the use of practice-oriented knowledge, build capacities and to demonstrate innovative solutions to accelerate the transition to a sustainable management and use of natural resources in farming and forestry. This will lead to more informed and engaged stakeholders and

192 According to the requirements of the multi-actor approach

users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS[193]).

Project results are expected to contribute to the following outcomes:

1. Making information and knowledge readily available and easy accessible to farmers, foresters, advisors and other users[194] of practice-ready knowledge. This will support the policy objectives linked to Cluster 6, such as the European Green Deal, the farm to fork strategy and the CAP, the biodiversity strategy and the wider bioeconomy research and policies by supporting the transition process across the EU in new and coherent ways;

2. The CAP cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake[195]. This project will provide overall support related to concrete practice-oriented knowledge co-creation, the (digital) organisation of it and the sharing of approaches to do so among Member States;

3. The outcomes will be connecting actors, policies, projects and instruments to speed up innovation and the sharing of knowledge, in particular by:

(a) creating added value by better linking research, education, advisors and farming practice to trusted information sources and encouraging the wider use of available knowledge and innovation;

(b) connecting innovation actors and projects; resulting in faster and wider co-creation and transposition of innovative solutions into practice and communicating to the scientific community about the research needs of practice.

Scope: Proposals should address the following activities:

- Collect and enable sharing – as a minimum – of the outcomes of all multi-actor projects from Horizon 2020 and those from Horizon Europe, and of all EIP-AGRI Operational Group innovative projects 2014-2020 and of those to come in the 2021-2027 period. This should be done by developing, operating and fine-tuning the use of an open access and open source digital EU-wide knowledge reservoir for practice interoperable with the European innovation partnership "Agricultural productivity and sustainability" (EIP-AGRI). The knowledge reservoir should be refined to make the tool as interactive and interoperable as possible with Member States' growing number of websites and knowledge reservoirs for agriculture and forestry practice, and integrate as much as possible practice-oriented project outcomes from any other funding source. Where needed, this may entail policy dialogues and small studies;

- Develop this tool, which is to be owned and exploited by the EU, enabling it to serve the knowledge interactions within the EIP-AGRI network, in particular with a view to explore how to encourage emergence of new EIP-AGRI innovation projects by connecting projects and actors. To this end, the project should collaborate with the EIP-AGRI networks at Member State and at EU level;

- Share the output of the EU knowledge reservoir as widely as possible, using existing dissemination channels for farmers and foresters and national/regional/local AKIS channels, with

193 AKIS means the organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields (Agricultural Knowledge and Innovation).

194 See definition of the 'multi-actor approach' in the introduction to this work programme part.

195 Article 5 of the CAP post 2020 proposal

the support of AKIS coordination bodies and platforms in Member States. Explore the possibilities for translation of its content into EU languages;

- Develop interactive communication activities on the outcomes of clusters of projects in the reservoir, so that the knowledge comes to life through workshops and encounters between AKIS' actors, in particular those who have common interests across the EU. This will be the way to find out whether the knowledge reservoir meets end-users' expectations. Through peer-to-peer activities and mixed actor events on dedicated parts of the content of the knowledge reservoir, enable innovations to arise from existing work, using the inputs and suggestions received from key actors all over the EU;

- Use the collected material to develop educational material for students, farmers, foresters, advisors and others[196], and for encouraging on-farm demonstrations. Give input for training of advisors and farmers (or other users). All this material is to be exploited across Europe through real life, one-to-one and virtual activities;

- The project should collaborate with all 27 EU Member States' AKIS' coordinating bodies[197] and related networks, and strongly connect to the EIP-AGRI at EU level. Make use of the AKIS coordination in each Member State to connect actors all over Europe working on specific subjects. This collaboration should serve to verify whether the reservoir indeed meets the expectations of Member States' AKIS' actors;

- Make use of local connections in all 27 EU Member States to interpret the national/regional contexts, including in particular the innovation strand of national CAP Networks. Use the knowledge and innovation experts in the SCAR-AKIS Strategic Working Group to discuss the project strategy and progress at the various stages of the project;

- Projects should have a minimum duration of 7 years, and build on the developments of the projects EURAKNOS[198] and EUREKA[199], and - if relevant - of similar international initiatives. They must implement the multi-actor approach, including as a minimum the EIP-AGRI and national CAP networks and AKIS actors from many Member States as well as IT-experts with experience in knowledge reservoirs. Proposals should include tasks to collaborate with these Horizon 2020 projects to take over the agreed IT standards and languages according to the outcomes of the feasibility discussions in EURAKNOS and EUREKA.

HORIZON-CL6-2021-GOVERNANCE-01-26: Deepening the functioning of innovation support

Specific conditions

196 See the requirements for the 'multi-actor approach' in the introduction to this work programme part.

197 "AKIS coordination bodies " in the CAP plans are responsible for the management of the Member States AKIS' strategies

198 https://cordis.europa.eu/project/id/817863

199 https://cordis.europa.eu/project/id/862790

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In support of the Green Deal, common agricultural policy and farm to fork objectives and targets, the successful proposal will focus on how to discover innovative ideas and how to enable the relevant actors to work out these ideas in a co-creative way as from the very start of the making of the proposal. The expected outcome of this topic is to develop sound, coherent and well-prepared innovation generation and support methods, which enable individual grassroots innovative ideas to come to fruition. It should help project coordinators to find methods to use the complementary knowledge of partners to develop ready-to-use solutions. Member States' authorities and actors of the agricultural knowledge and innovation system (AKIS) need insights and tools to improve the interaction, connections and drafting skills for preparation of innovation project proposals. This will eventually lead to useable and practice-oriented innovative project results, better informed practitioners motivated to implement those results and, as a consequence, increased impact of funding for multi-actor research and innovation and European innovation partnership (EIP) Operational Groups.

Member States AKISs need to be equipped to advance knowledge, build capacities and co-create innovative solutions to accelerate the transition to a sustainable and circular management and use of natural resources. To this end, the CAP post-2020 introduced for all Member States an obligation to have innovation support services in place[200], to speed up innovation by helping to develop individual innovative grassroots ideas into interactive innovation projects[201]. Such services can serve as one stop shops for innovation and should help future users of project results to prepare multi-actor innovative projects with a view to testing the potential innovation they have in mind. Member States need to find new ways to organise innovation support which fuels the generation of solutions for the transition process towards more sustainable farming and forestry. This can be done in particular in the form of a one-stop-shop for innovation, which can provide practical information on the subject of the potential project, existing scientific knowledge and project management as well as tips and tricks on how to develop such projects into a coherent project proposal. Being able to connect the most relevant actors with complementary knowledge is also an essential element, and will help to attain the objectives of the potential project. Deepening innovation support will need to take into account institutional barriers and lock-ins, political inertia and tackle power imbalances between potential actors involved in co-creative innovation processes.

200 Art 13(4) of the post 2020 CAP proposal

201 Such as Horizon Multi-actor projects or EIP-AGRI Operational Groups

Project results are expected to contribute to the following outcomes:

1. Helping innovation support services to tackle innovative ideas related to the policy objectives linked to Cluster 6, such as farm viability, agro-ecology, climate issues, pesticide reduction, reduction of water use and pollution, short supply chains, generational renewal, etc, as well as the European Green Deal, the Farm to Fork Strategy and the CAP, the Biodiversity Strategy and the wider bioeconomy research and policies.

2. Contribute to the CAP cross-cutting objective of modernising the sector by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake[202] . Projects shall provide overall support to generate practical approaches ultimately leading to better capturing of emerging needs and/or innovative opportunities, knowledge co-creation, in relation to the new obligation for Member States under the CAP post-2020[203] to have innovation support services in place, taking into account national and regional contexts.

3. The outcomes shall connect actors, policies, projects and instruments to speed up creation of innovative solutions, in particular by:

(a) creating added value by better linking research, education, advisors and farming practice and encouraging the wider use of available knowledge which can serve the innovative idea;

(b) connecting innovation actors and projects; resulting in faster co-creation of ready-to-use innovative solutions, spreading them into practice and communicating the research needs of practice to the scientific community.

Scope: Proposals should address the following activities:

- Develop approaches to set up and improve the functioning of innovation brokers, which have the capacities to find individual innovative grassroots ideas at an early stage as well as practice needs or innovative opportunities. These innovative ideas should then be developed with the support of the owner of the idea and a number of relevant actors with complementary knowledge into an EIP-AGRI interactive innovation project[510], using methods ensuring co-ownership of the initiators and partners in the project. Seed funding as used for EIP-AGRI Operational Group projects is often a good solution to accompany this process, but also other approaches such as “innovation advice” or “innovation coaching” are an option to investigate[204].

- Explore how such innovation support approaches could be embedded in the national/regional AKIS, in particular through useful connections with advisors, and how they can be linked to other broader innovation support mechanisms, including research, advisors and CAP networks at Member State or regional level[205].

- Investigate and compare among Member States how the governance of such innovation support could be organised at the level of the managing authorities (single “one-stop-shop” service or mixed model with several smaller and/or bigger innovation support services, or…) taking into account the great variety of contexts in Member States and regions.

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202 Art 5 CAP post 2020 proposal

203 Art 13(4) CAP post 2020 proposal

204 See EIP-AGRI seminar on AKIS : https://ec.europa.eu/eip/agriculture/en/event/eip-agri-seminar-cap-strategic-plans-key-role-akis

205 Art 102 of the CAP post 2020 proposal

- Cover all 27 EU Member States in the project to ensure learning from diversity. Make use in all those countries of experts who understand and are able to make an accurate interpretation of the national/regional contexts and its impact to help develop the ideal solution for that Member State.

- Projects should have a minimum duration of 6 years, investing most in the very first years, and use the support from the knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategy and progress in the various stages of the project. They must implement the multi-actor approach, including existing experienced innovation support services as partners which can share their methods and help develop solutions in other contexts.

- As foreseen in the Multi-Actor Approach requirements[206], provide all outcomes and materials to the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI), including in the common 'practice abstract' format for EU wide dissemination, including as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-24) in the requested formats.

HORIZON-CL6-2021-GOVERNANCE-01-27: Developing EU advisory networks on consumer-producer chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In support of the Green Deal, CAP and farm to fork objectives and targets, the successful proposal will focus on advisor exchanges across the EU to increase the speed of knowledge creation and sharing, capacity building, of demonstration of innovative solutions, as well as helping to bring them into practice, which accelerates the needed transitions. Agricultural Knowledge and Innovation Systems (AKIS) in which advisors are fully integrated[207] are key drivers to speed up innovation and the uptake of research results by farmers.

Primary producers have a particular need for impartial, ready-to-use and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds

206 See introduction of the Work Programme
207 Article 13(2) of the CAP post 2020

up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems.

Transformative changes such as those required within the European Green Deal are dynamic processes that require appropriate governance of AKIS actors. Advisors are key actors strongly guiding and with powerful influence over producers' decisions. A novelty in the post-2020 CAP plans[208] is that advisors now must be integrated within the Member States' AKIS, and that the scope of their actions has become much broader. They must now be able to cover economic, environmental and social domains, as well as be informed on up-to-date science and technology. They should be able to translate this knowledge into opportunities and use and adapt those to specific local circumstances. This specific topic focuses on the important role advisors can play to exploit the potential of connecting consumers with producers through short supply chains, an upcoming issue in the more sustainable and diversified agriculture of the future.

Project results are expected to contribute to the following outcomes:

1. Production of supporting services and sharing of materials to facilitate the upscaling of short supply chains, such as knowledge networks and peer-to-peer counselling, master classes, inspiration tours, advice modelling, communication and education materials, sharing of effective business models and making use of possible accelerators serving both producers and consumers, SWOT analysis schemes, (new) business model analyses, etc

2. Development of interaction with regional, national and EU policy makers, potentially leading to an EU network to discuss institutional barriers to producer-consumer chains, including bottlenecks, lock-ins, political inertia, ambiguous regulations, inequality between Member States and power imbalances;

3. The policy objectives linked to Cluster 6, as well as the European Green Deal, and in particular the Farm to Fork Strategy and the Common Agricultural Policy, with the objective to increase farmer viability and raise consumer awareness on connecting producers and consumers in short food supply chains;

4. The CAP cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake[209] . This project shall provide overall support related to knowledge creation, organisation and sharing of novel information across borders. It shall help to fill gaps on emerging advisory topics which is useful in particular in relation with the new obligation for Member States to integrate advisors within their AKIS which shall cover a much broader scope than in the former period;

5. The outcomes should speed up the introduction, spread and bringing into practice of innovative solutions related to consumer-producer chains overall, in particular by:

(a) creating added value by better linking research, education, advisors and farming practice and encouraging the wider use of available knowledge across the EU;

208 Art 13(2) of the post-2020 CAP regulation

209 Art 5 CAP post-2020 proposal

(b) learning from innovation actors and projects, resulting in faster sharing and implementation of ready-to-use innovative solutions, spreading them into practice and communicating to the scientific community the bottom-up research needs of practice.

Scope: Proposals should address the following activities:

- Connect advisors with knowledge on short supply chains who have a broad and extensive network of farmers across all EU Member States into an EU advisory network on short food supply chains to better connect consumers with producers, securing producers' income, building on the outcomes of the EIP-AGRI Workshop "Cities and Food – Connecting Consumers and Producers" and the Focus Group on Short Food Supply Chains[210].

- Share effective and novel short chain approaches and experiences among this EU advisory network. These approaches must be sustainable in terms of economic, environmental and social aspects.

- Focus on cost-benefit elements. Collect and document good examples in this regard, connecting with farmers, intermediates and consumers in Member States to be able to take into account financial aspects and local conditions. Select the best practices, learn about the key success factors, possible quick wins and make them available for (local) exploitation, to ensure financial win-wins for producers and consumers.

- Integrate the advisors of the EU short food supply chain network into the Member States' AKIS as much as possible. They can provide encouragement as innovation brokers in local short chain projects of European innovation partnership "Agricultural productivity and sustainability" (EIP-AGRI) Operational Groups. They should give hands-on training to farmers and local advisors, lead national thematic and learning networks on the subject, deliver and implement action plans with interested farmers, inspire new and incoming farmers or farms at the cross-roads of intergenerational renewal, connect with education and ensure broad communication, support peer-to-peer consulting, develop on-farm demonstrations and YouTube demo films, and provide specific back-office support for generalist advisors within the national/regional AKIS.

- Explore if the some or all activities of the EU advisory network on short supply chains can be upscaled at the level of a number of Member States under a cooperative format. Wherever possible, develop digital advisory and accelerator tools for common and open use across the EU. Determine whether common instruments can be created to incentivise the implementation of short food supply chains linking producers with consumers, for instance in the framework of smart villages, or to incentivise novel food strategies for cities, villages and rural areas, etc.

- Include all 27 EU Member States in the EU advisory network. Make use in all those countries of experts who understand and are able to make an accurate interpretation of the national / regional contexts to help develop the best solutions for that Member State or region. Use the support from the knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategies, coordination and progress in the various stages of the 2 projects. Projects should run at least 5 years. They must implement the multi-actor approach.

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210 https://ec.europa.eu/eip/agriculture/en/event/eip-agri-workshop-cities-and-food-%E2%80%93-connecting

- Provide all outcomes and materials to the EIP-AGRI, including in the common 'practice abstract' format for EU wide dissemination, as well as to national / regional / local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-24) in the requested formats.

HORIZON-CL6-2021-GOVERNANCE-01-28: Thematic networks to compile and share knowledge ready for practice

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.50 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In support of the Green Deal, CAP and farm to fork objectives and targets, the successful proposal will focus on knowledge sharing in a language that is easy to understand and is targeted to farmers and foresters. Primary producers have a particular need for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. This speeds up innovation and the uptake of results, and is key to improve sustainability. It adds value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food systems, bioeconomy and biodiversity. This will lead to more informed and engaged stakeholders and users of project results including primary producers and consumers thanks to effective platforms such as Agriculture Knowledge and Innovation Systems (AKIS[211]).

Despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, and often research findings are not integrated into agricultural and forestry practice. Proposals, acting at EU level to remedy this situation, are essential because national and sectoral AKISs are insufficiently connected and organised to fully meet the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors.

Project results are expected to contribute to the following outcomes:

[211] AKIS (Agricultural Knowledge and Innovation System) means the organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields

- The cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake[212] , as well as European Green Deal and Farm to Fork objectives;

- The collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners.

- Conserve practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels that farmers/foresters consult most often.

- Increase the flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system;

Achieve greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.

Scope: Proposals should address the following activities:

- Summarise, share and present - in a language that is easy to understand and is targeted to farmers and foresters – the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners. The specific themes of the networks can be chosen in a 'bottom-up' way on the condition that they tackle the most urgent farmers' or foresters' needs.

- Compile a comprehensive description of the state of current farming practices on the chosen theme to explain the added-value of the proposal and the relevance of the theme. Proposals shall focus on the cost/benefit aspects of the practices collected and summarised, and clarify how the project avoids duplication with ongoing or completed projects and networks.

- Deliver an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, making use of audio-visual material wherever possible, including also materials serving education and training;

- This range of material should feed into the existing dissemination channels most consulted by farmers and foresters in the countries.

- As many "practice abstracts" in the common European innovation partnership "Agricultural productivity and sustainability" (EIP-AGRI) format as possible, as well as other type of materials should be provided to the EIP-AGRI, as well as to national / regional / local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-22), all in the requested formats;

[212] Art 5 of the post 2020 CAP regulation

- Besides giving the details on the EIP-AGRI Operational Groups which are strongly recommended to be involved[213], wherever possible and relevant to the chosen theme, provide also details on how further synergies will be built with future EIP-AGRI Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.

- Proposals must implement the 'multi-actor approach', with a consortium based on a balanced mix of actors with complementary knowledge clearly activating farmers/foresters, farmers' groups and advisors; and run for minimum 3 years.

213 According to the requirements of the multi-actor approach